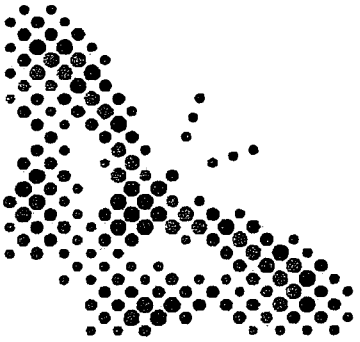
REVISED DRAFT

GeoProbe SAMPLING PLAN

CPS/Madison
Superfund Site

SUBMITTED BY



Ciba

SUBMITTED TO

EPA

United States Environmental Protection Agency

PREPARED BY

Ciba Specialty Chemicals
Corporate Remediation
Toms River, New Jersey
February 3, 2006

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1. Background

Ciba Specialty Chemicals Inc. acquired responsibility for the CPS Chemical Company Old Bridge Facility in March 1998 as part of their acquisition of Allied Colloids. The site has a long and well documented regulatory and operational history and for the purposes of this report will continue to be referred to as the CPS site.

In October 1992, CPS Chemical Company, Inc. (CPS) and the New Jersey Department of Environmental Protection (NJDEP) executed an Administrative Consent Order (ACO) requiring CPS to perform a remedial investigation (RI) and feasibility study (FS) at the CPS facility in Old Bridge, New Jersey, in accordance with and New Jersey Technical Requirements for Site Remediation. (NJAC 7:26E, 1997) and the United States Environmental Protection Agency's (USEPA) "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (USEPA, 1988). The CPS RI was completed in three phases (Phase I(1993), Phase II(1995) and Phase III(1996)) and approved by the NJDEP. As a result of the RI, contaminated soils and ground water were delineated, and an interim ground water recovery system was installed and began operation in March 1996. Since their inception, these remediation measures have significantly reduced groundwater contaminant concentrations in the production source area and in the downgradient groundwater plume. On-going optimization of the groundwater recovery system continues and a Feasibility Study was submitted to the NJDDEP and USEPA during 2001. Manufacturing activity was terminated at the site on December 14, 2001. In October 2003, the state requested that EPA take the lead for the CPS/Madison site.

As a result of the transition from NJDEP to USEPA lead, an RI/FS Summary report was prepared and issued to the USEPA on November 7, 2005. In that report, results of recent sampling and investigations were discussed and presented our current understanding of the contaminant plume and source area soils. This section of the report is provided here (Attachment #1) as a background document, detailing the need for additional data gathering and provides the basis for this proposed sampling event. However, it is clear that a significant amount of VOC mass is crossing the CPS property line near CPS-1 (see Figure 1). While these are similar compounds as are found in the extraction wells, based on concentration magnitude both in extracted groundwater and in the characterized source area, it is not clear whether this mass is associated with the characterized source area or is associated with an unknown source. Therefore, an additional field investigation will be conducted in an effort to fill some exiting data gaps

2. Purpose

This field sampling plan is intended to describe a supplemental field investigation for site soils and groundwater characterization and to investigate the increase in VOC concentrations noted in sentinel well CPS-1. In our meeting held with EPA on November 17, 2005 Ciba described the increase in volatile organic chemical contamination in ground water monitoring sentinel well CPS-1. In an attempt to characterize the nature and

extent of contamination at CPS-1, Ciba proposes a screening assessment that includes the installation of six (6) temporary piezometers for water quality and water level measurement and the completion of one (1) boring for water quality measurement in the general area of CPS-1. Figure # 1 provides a location map of the proposed sampling locations.

While the drilling equipment is mobilized on-site to complete this work, soil samples will also be secured at each probe location described above, which will aid in the further delineation of the source area soils. Additionally, two borings (identified as TF-2A & TF-2B in Fig. #1) will be completed in the Tank Farm #2 area to investigate an area of "stained soil" recently uncovered during demolition activity.

3. Piezometer Installation and Groundwater Sample Collection

SGS Drilling will provide an all terrain dual tube GeoProbe rig to accomplish the work. At specified intervals (described in Table #1) a groundwater sample will be collected utilizing a peristaltic pump. Samples will be collected into 40 ml vials for VOC analysis. New pump tubing will be utilized for each sample. As stated above, this is a screening level assessment and the data quality objectives are broad in nature.

At a specified depth of 25 or 30 feet (depending on ground surface elevation), a 11/2 inch piezometer with a five foot screen will be installed and left in place at 6 locations for approximately six months. Permits for these temporary piezometers have been secured from the NJDEP. One (1) additional borehole will be completed with groundwater samples collected at two intervals in the borehole (see Table #1). The borehole will be grouted as necessary when the drilling equipment is removed.

Decontamination procedures and field QA/QC protocols as detailed in the soils sampling section below will be utilized. It is anticipated that the analysis will be performed by Ciba Remediation Laboratory located at the Toms River Superfund Site (approved by USEPA Region II). However, samples may also be sent to Lancaster Laboratories for analysis.

4. Soil and Groundwater Sampling

Soil cores will be collected in 5 foot Macrocore tube samplers lined with an acetate liner. Five foot length cores will be collected at selected intervals at each location. A discrete soil VOC sample will be collected from each specified interval. Hnu or similar PID screening will be conducted along the length of each recovered core sample. PID readings will be conducted every 6 inches and recorded. A discrete VOC sample will be collected at the section of the core which exhibits the highest PID reading. Thus the VOC sample will be BIASED high. A single composite sample will be collected from the Tank Farm #2 area for semi-volatile and metals analysis. An area of "stained soil" was recently uncovered in this area during demolition activity which needs to be characterized.

Site field conditions and occurrences may require changes to the sampling location and/or interval.

4.1 SAMPLE COLLECTION METHODOLOGY

- Drive the Macrocore tube sampler into the soil
- Withdraw the sampler. Screen the end of the sampler with a PID before disassembling. Record readings into field notes.
- Disassemble sampler and split acetate sleeve by cutting it open parallel to the 5 foot core.
- Screen by PID – record reading at each 6 inch length into logbook.
- Transfer the sample from core into appropriate containers. VOC samples will be collected in two (2) ounce jars with a Teflon lined septum cap. Samples for SVOC/metals/other analysis will utilize appropriate sized jars with Teflon lined caps.
- All soil samples will be unpreserved but kept in coolers until delivered to the laboratory.
- Install tubing and utilizing peristaltic pump collect ground water sample if required (40 ml vial with preservative). Remove tubing.
- Label each sample in accordance with the Ciba EQuIS[1] identification system.
- Advance geoprobe to selected depth, then advance Macrocore.
- Repeat above as required.

4.2 DECONTAMINATION PROCEDURE

The geoprobe tube samplers and drill rods will be steamed cleaned with high - pressure water prior to use at the site.

If disposable sampling equipment is used, this equipment will not need to be decontaminated.

Otherwise, at the start of each new piezometer/borehole, sample equipment including tube samplers and drilling equipment will be cleaned following the procedure outlined below. Soils generated during the drilling process will be left on site. If non-disposable sampling equipment is used, the following decontamination procedure will be used for sampling equipment:

- Remove visual contamination and wipe clean.
- Wash with detergent and site tap water.
- Rinse with tap water.
- Rinse with distilled water.
- Rinse with isopropyl alcohol.
- Air dry.
- Final rinse with distilled water.
- Air dry.

[1] EQuIS from EarthSoft, Inc. is used by Ciba for its environmental database.

While collecting samples from different intervals within the same borehole, tube sampler and other sampling equipment will also be cleaned.

- Remove visual contamination and wipe clean.
- Wash with detergent and site tap water.
- Rinse with tap water.
- Rinse with distilled water.

5.0 Analytical and QA/QC

All analytical methods utilized for analysis of samples will be from USEPA "Test Methods for Evaluating Solid Waste: Physical/Chemical Methods," April 1998, SW-846, revision 5.

5.1. Soil samples are to be collected in a two ounce pre-cleaned glass jar with a Teflon septum cap for VOC samples. The soil sample will be methanol extracted in the laboratory utilizing EPA Method 5035A, followed by Method 8260 analysis (see Table 2 for Target Compound List). Semi-volatile soil samples will be collected in 500 ml pre-cleaned glass jars with Teflon lined caps. The samples will be extracted by Method 3545 followed by Method 8270 analysis (see Table 3 for Target Compound List). Metals samples will be collected in pre-cleaned 250 ml glass jar with a Teflon lined cap and extracted by Method 3050B and analyzed by Method 6010B for the standard Target Analyte List (Table 4). Volatile "surrogates" and internal standards are listed in Table 5, and semi-volatile surrogates and internal standards utilized are listed in Table 6.

5.2 Ground water samples will be collected directly into 40 ml vials preserved with 1:1 HCL and analyzed via Method 8260 (see Table 2 for compound) list.

5.3 Sampling containers, preservation methods and sample holding times will be consistent with the laboratory 's Quality Assurance Manuel. All samples will be placed into coolers and cooled to 4 degrees C with ice and shipped to Lancaster Laboratories or Ciba's in-house laboratory. Chain of Custody will be maintained for all samples from bottle origin to laboratory. See Ciba Remediation and Lancaster Laboratories Quality Assurance Manuals (paper or CD copy provided as Attachment #2 and Attachment #3).

5.4 A duplicate sample (DUP) will be secured for every 20 samples as will an additional MS/MSD sample for every 20 samples.

5.5 If analysis is performed by the Ciba laboratory, five (5) percent of the samples will be sent to Lancaster laboratories for confirmatory analysis

6.0 FIELD QUALITY ASSURANCE SAMPLES

6.1 Equipment field blanks will be utilized for quality assurance purposes to assess the possible effects of inadvertent sampling contamination. An equipment field rinse blank consists of containers that are transported to the site empty and filled with contaminant-free, reagent grade water that has rinsed the clean sampling equipment so as to provide data to evaluate the effectiveness of decontamination procedures. During the collection of samples, one field rinse blank will be collected at the start of each boring.

6.2 In addition to equipment field rinse blanks, trip blanks will also be utilized. A trip blank consists of containers filled with contaminant-free, reagent grade water that accompanies clean bottles shipped to the site. These containers of water remain unopened and accompany the samples back to the laboratory. The purpose is to provide data that can be used to evaluate whether contamination has been introduced from a source other than contamination attributable to the site.

7.0 ANALYTICAL DATA PACKAGE

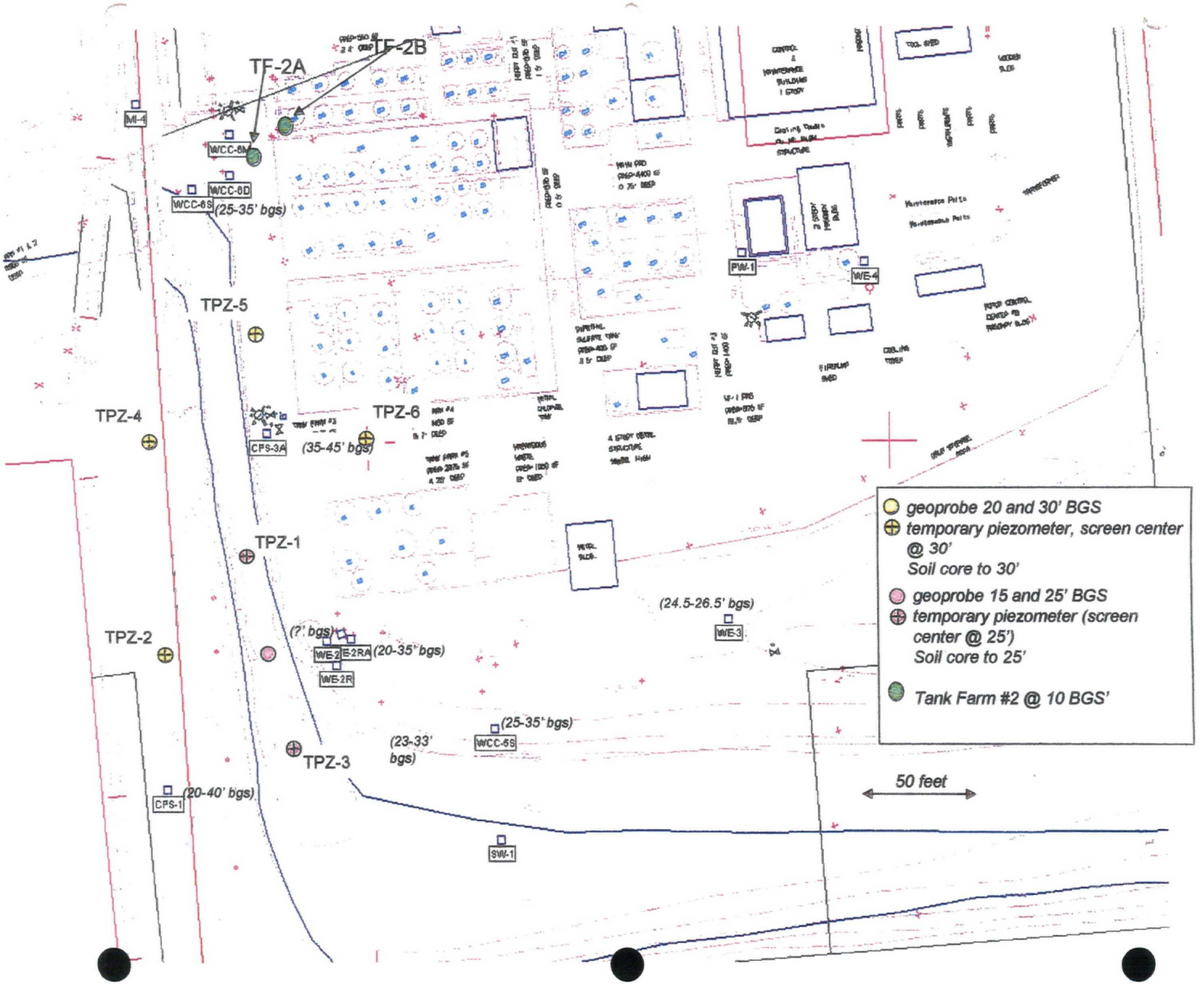
The analytical data deliverable consists of an EDD in an EQuIS four (4) - file format provided by the laboratory. Analytical results will be provided to USEPA within 45 days. A CLP equivalent data package can also be supplied from the laboratory if required. Data from five (5) percent of the samples will be validated. Validation will be performed by Advanced GeoServices Corporation, located in West Chester, Pennsylvania.

8.0 REPORTING

The data collected will be analyzed and incorporated into the conceptual model for the site. A report will be provided which includes a summary of the data and conclusions and recommendations based on data analysis.

See next page for proposed Sample Analysis Table

FIGURES


TF-2A
TF-2B
MI-4
WCC-6M
WCC-6D
WCC-6S
(25-35' bgs)
TPZ-5
TPZ-4
TPZ-6
CPS-3A
(35-45' bgs)
PW-1
WE-4
TPZ-1
TPZ-2
(?' bgs)
WE-2
E-2RA
(20-35' bgs)
WE-2R
(24.5-26.5' bgs)
WE-3
(25-35' bgs)
WCC-5S
(23-33' bgs)
TPZ-3
CPS-1
(20-40' bgs)
SW-1
geoprobe 20 and 30' BGS
temporary piezometer, screen center @ 30'
Soil core to 30'
geoprobe 15 and 25' BGS
temporary piezometer (screen center @ 25')
Soil core to 25'
Tank Farm #2 @ 10 BGS'
50 feet

TABLES

TABLE 1

Proposed Sample/Analysis

	TP-1	BH-1	TP-2	TP-3	TP-4	TP-5	TP-6	TF-2A	TF2B
depth									
0-5								S1	S1
5-10			S1+GW		S1+GW	S3+GW	S3+GW	S3+GW	S1
10-15	S1+GW	S1+GW		S1+GW					
15-20			S1+GW		S1+GW	S1+GW	S1+GW		
20-25	S1+GW	S1+GW		S1+GW					
25-30			S1+GW		S1+GW	S1+GW	S1+GW		
GW=VOC	water								
S1=VOC	soil								
S3=VOC	SVOC	Metals	(soils)						
Total	22 groundwater		VOCs						
	22 soil		VOCs						
	1 soil		SVOC						
	1 soil		metals						

1A

Volatile Organic Analysis Data Sheet

Table 2
8260 Target Compound

Lab Name: Ciba Remediation Testing Lab.
Lab Code: _____
Matrix: (soil/water) Water
Sample wt/vol 5 ml
Level: (low/med) low
% Moisture:
GC Column: RTX-502 I.D.: 0.25mm

Test Code:
LIMS Number.:
Lab Sample Id.: L
Lab File Id.: B1060127.D
Date Sampled.:
Date Analyzed: 01/27/06
Dilution Factor: 1

CAS NO.	COMPOUND	RESULT ug/L	MDL ug/L	Q
75-71-8	Dichlorodifluoromethane	N.D.	0.6	U
74-87-3	Chloromethane	N.D.	0.6	U
75-01-4	Vinyl Chloride	N.D.	1.4	U
74-83-9	Bromomethane	N.D.	0.9	U
75-00-3	Chloroethane	N.D.	1.0	U
75-69-4	Trichlorofluoromethane	N.D.	0.5	U
60-29-7	Diethyl Ether	N.D.	0.9	U
67-64-1	Acetone	N.D.	4.0	U
75-35-4	1,1-Dichloroethene	N.D.	0.9	U
74-88-4	Methyl Iodide	N.D.	2.5	U
107-05-1	Allyl Chloride	N.D.	1.5	U
75-15-0	Carbon Disulfide	N.D.	0.6	U
75-09-2	Methylene Chloride	N.D.	1.3	U
107-13-1	Acrylonitrile	N.D.	1.8	U
1634-04-4	Methyl-t-butyl Ether	N.D.	0.5	U
156-60-5	trans-1,2-Dichloroethene	N.D.	0.8	U
75-34-3	1,1-Dichloroethane	N.D.	0.2	U
78-93-3	2-Butanone	N.D.	2.2	U
107-12-0	Propionitrile	N.D.	5.4	U
594-20-7	2,2-Dichloropropane	N.D.	0.6	U
156-59-2	cis-1,2-Dichloroethene	N.D.	0.7	U
126-98-7	Methacrylonitrile	N.D.	2.1	U
96-33-3	Methyl Acrylate	N.D.	0.8	U
67-66-3	Chloroform	N.D.	0.4	U
74-97-5	Bromochloromethane	N.D.	1.7	U
109-99-9	Tetrahydrofuran	N.D.	5.9	U
71-55-6	1,1,1-Trichloroethane	N.D.	0.5	U
109-69-3	1-Chlorobutane	N.D.	0.6	U
563-58-6	1,1-Dichloropropene	N.D.	0.6	U
56-23-5	Carbon Tetrachloride	N.D.	0.5	U
107-06-2	1,2-Dichloroethane	N.D.	0.6	U
71-43-2	Benzene	N.D.	0.3	U
79-01-6	Trichloroethene	N.D.	0.5	U
78-87-5	1,2-Dichloropropane	N.D.	0.6	U
80-62-6	Methyl Methacrylate	N.D.	0.9	U
75-27-4	Bromodichloromethane	N.D.	0.4	U
74-95-3	Dibromomethane	N.D.	0.7	U
108-10-1	4-Methyl-2-Pentanone	N.D.	0.7	U
10061-01-5	cis-1,3-Dichloropropene	N.D.	0.4	U
108-88-3	Toluene	N.D.	0.4	U
10061-02-6	trans-1,3-Dichloropropene	N.D.	0.3	U

1A

Volatile Organic Analysis Data Sheet

Lab Name: Ciba Remediation Testing Lab.		Test Code:	8260-w
Lab Code: _____		LIMS Number.:	
Matrix: (soil/water)	Water	Lab Sample Id.:	Blank
Sample wt/vol	5 ml	Lab File Id.:	B1060127.D
Level: (low/med)	low	Date Sampled.:	
% Moisture:		Date Analyzed:	01/27/06
GC Column: RTX-502 I.D.: 0.25mm		Dilution Factor:	1

CAS NO.	COMPOUND	RESULT ug/L	MDL ug/L	Q
97-63-2	Ethyl Methacrylate	N.D.	0.6	U
79-00-5	1,1,2-Trichloroethane	N.D.	0.8	U
106-93-4	1,2-Dibromoethane	N.D.	0.9	U
591-78-6	2-Hexanone	N.D.	0.6	U
142-28-9	1,3-Dichloropropane	N.D.	0.6	U
127-18-4	Tetrachloroethene	N.D.	0.7	U
124-48-1	Dibromochloromethane	N.D.	0.5	U
108-90-7	Chlorobenzene	N.D.	0.5	U
630-20-6	1,1,1,2-Tetrachloroethane	N.D.	0.6	U
100-41-4	Ethylbenzene	N.D.	0.4	U
1330-20-7	m+p-Xylene	N.D.	1.0	U
95-47-6	o-Xylene	N.D.	0.8	U
100-42-5	Styrene	N.D.	0.6	U
75-25-2	Bromoform	N.D.	0.5	U
98-82-8	Isopropylbenzene	N.D.	0.3	U
79-34-5	1,1,2,2-Tetrachloroethane	N.D.	0.9	U
96-18-4	1,2,3-Trichloropropane	N.D.	1.0	U
110-57-6	trans-1,4-Dichloro-2-Butene	N.D.	1.2	U
103-65-1	n-Propylbenzene	N.D.	0.4	U
108-86-1	Bromobenzene	N.D.	0.8	U
108-67-8	1,3,5-Trimethylbenzene	N.D.	0.5	U
95-49-8	2-Chlorotoluene	N.D.	0.6	U
106-43-4	4-Chlorotoluene	N.D.	0.6	U
98-06-6	tert-Butylbenzene	N.D.	0.4	U
95-63-6	1,2,4-Trimethylbenzene	N.D.	0.4	U
76-01-7	Pentachloroethane	N.D.	1.8	U
135-98-8	sec-Butylbenzene	N.D.	0.4	U
99-87-6	4-Isopropyltoluene	N.D.	0.3	U
541-73-1	1,3-Dichlorobenzene	N.D.	0.4	U
106-46-7	1,4-Dichlorobenzene	N.D.	0.5	U
104-51-8	n-Butylbenzene	N.D.	0.2	U
95-50-1	1,2-Dichlorobenzene	N.D.	0.3	U
67-72-1	Hexachloroethane	N.D.	1.2	U
96-12-8	1,2-Dibromo-3-Chloropropane	N.D.	2.7	U
120-82-1	1,2,4-Trichlorobenzene	N.D.	0.6	U
87-68-3	Hexachlorobutadiene	N.D.	0.6	U
91-20-3	Naphthalene	N.D.	1.0	U
87-61-6	1,2,3-Trichlorobenzene	N.D.	0.4	U

Semivolatile Organic Analysis Data Sheet

Table 3
8270 Target Compound

Lab Name: Ciba Remediatation Testing Lab.
Lab Code: _____
Matrix: (soil/water) Water
Sample wt/vol 1000 ml
Level: (low/med) low
% Moisture:
GC Column: DB-5MS I.D.: 0.25mm

Test Code:
LIMS Number:
Lab Sample Id.: _____
Lab File Id.: S5042103.D
Date Sampled:
Date Analyzed: 04/21/05
Dilution Factor: 1

CAS NO.	COMPOUND	RESULT ug/L	MDL ug/L	Q
62-75-9	N-Nitrosodimethylamine	N.D.	100.0	U
110-86-1	Pyridine	N.D.	100.0	U
108-95-2	Phenol	N.D.	11.5	U
62-53-3	Aniline	N.D.	14.3	U
111-44-4	bis (2-Chloroethyl) ether	N.D.	10.9	U
95-57-8	2-Chlorophenol	N.D.	10.4	U
541-73-1	1,3-Dichlorobenzene	N.D.	17.6	U
106-46-7	1,4-Dichlorobenzene	N.D.	19.4	U
100-51-6	Benzyl Alcohol	N.D.	12.2	U
95-50-1	1,2-Dichlorobenzene	N.D.	15.5	U
95-48-7	2-Methylphenol	N.D.	13.2	U
39638-32-9	bis (2-Chloroisopropyl) ether	N.D.	16.4	U
106-44-5	4-Methylphenol	N.D.	14.6	U
621-64-7	N-Nitrosodi-N-propylamine	N.D.	7.7	U
67-72-1	Hexachloroethane	N.D.	16.7	U
98-95-3	Nitrobenzene	N.D.	13.2	U
75-59-1	Isophorone	N.D.	9.3	U
88-75-5	2-Nitrophenol	N.D.	9.1	U
105-67-9	2,4-Dimethylphenol	N.D.	20.2	U
111-91-1	bis (2-Chloroethoxy) methane	N.D.	9.3	U
65-85-0	Benzoic Acid	N.D.	14.9	U
120-83-2	2,4-Dichlorophenol	N.D.	12.7	U
120-82-1	1,2,4-Trichlorobenzene	N.D.	11.5	U
91-20-3	Naphthalene	N.D.	11.7	U
106-47-8	4-Chloroaniline	N.D.	14.6	U
87-68-3	Hexachlorobutadiene	N.D.	11.2	U
59-50-7	4-Chloro-3-methylphenol	N.D.	18.2	U
91-57-6	2-Methylnaphthalene	N.D.	10.7	U
77-47-4	Hexachlorocyclopentadiene	N.D.	11.9	U
88-06-2	2,4,6-Trichlorophenol	N.D.	11.9	U
95-95-4	2,4,5-Trichlorophenol	N.D.	15.1	U
91-58-7	2-Chloronaphthalene	N.D.	10.5	U
88-74-4	2-Nitroaniline	N.D.	13.0	U
131-11-3	Dimethyl Phthalate	N.D.	4.4	U
606-20-2	2,6-Dinitrotoluene	N.D.	18.2	U
208-96-8	Acenaphthylene	N.D.	9.1	U
99-09-2	3-Nitroaniline	N.D.	34.6	U
83-32-9	Acenaphthene	N.D.	7.2	U
51-28-5	2,4-Dinitrophenol	N.D.	17.6	U
100-02-7	4-Nitrophenol	N.D.	34.6	U
121-14-2	2,4-Dinitrotoluene	N.D.	14.8	U
132-64-9	Dibenzofuran	N.D.	7.9	U

1B

Semivolatile Organic Analysis Data Sheet

Lab Name: Ciba Remediatation Testing Lab.		Test Code:	8270-w
Lab Code: _____		LIMS Number:	4646
Matrix: (soil/water)	Water	Lab Sample Id.:	38397 - 1/27/05
Sample wt/vol	100 ml	Lab File Id.:	S5042103.D
Level: (low/med)	low	Date Sampled:	01/27/05
% Moisture:		Date Analyzed:	04/21/05
GC Column: DB-5MS I.D.: 0.25mm		Dilution Factor:	10

CAS NO.	COMPOUND	RESULT ug/L	MDL ug/L	Q
84-66-2	Diethyl Phthalate	N.D.	3.0	U
7005-72-3	4-Chlorophenyl phenyl ether	N.D.	6.0	U
86-73-7	Fluorene	N.D.	7.8	U
100-01-6	4-Nitroaniline	N.D.	19.4	U
534-52-1	4,6-Dinitro-2-methylphenol	N.D.	11.8	U
86-30-6	N-Nitrosodiphenylamine	N.D.	4.0	U
103-33-3	Azobenzene	N.D.	6.4	U
101-55-3	4-Bromophenyl phenyl ether	N.D.	6.3	U
118-74-1	Hexachlorobenzene	N.D.	6.4	U
87-86-5	Pentachlorophenol	N.D.	19.4	U
85-01-8	Phenanthrene	N.D.	5.2	U
120-12-7	Anthracene	N.D.	4.6	U
86-74-8	Carbazole	N.D.	5.5	U
84-74-2	Di-n-butyl Phthalate	N.D.	3.9	U
206-44-0	Fluoranthene	N.D.	3.9	U
92-87-5	Benzidine	N.D.	200.0	U
129-00-0	Pyrene	N.D.	4.8	U
85-68-7	Butylbenzyl Phthalate	N.D.	3.7	U
91-94-1	3,3-Dichlorobenzidine	N.D.	14.2	U
56-55-3	Benz (a) anthracene	N.D.	3.9	U
117-81-7	Bis (2-ethylhexyl) Phthalate	N.D.	13.6	U
218-01-9	Chrysene	N.D.	6.6	U
117-84-0	Di-n-octyl Phthalate	N.D.	8.3	U
CG-600-03	Benzo (b+k) fluoranthene	N.D.	6.9	U
50-32-8	Benzo (a) pyrene	N.D.	7.8	U
193-39-5	Indeno (1,2,3-cd) pyrene	N.D.	7.3	U
53-70-3	Dibenz (a,h) anthracene	N.D.	7.3	U
191-24-2	Benzo (ghi) perylene	N.D.	10.1	U

Table 4
6010B Target Analyte

Table B4-2
Metals Compound List (TAL)

Analyte	Waters		Soils**	
	LOQ* (mg/L)	MDL (mg/L)	LOQ* (mg/kg)	MDL (mg/kg)
Aluminum	0.2	0.041	20	2.96
Antimony[1]	0.02	0.0085	2.	0.66
Arsenic[1]	0.01	0.0049	1.	0.5
Barium[1]	0.005	0.00042	0.5	0.032
Beryllium[1]	0.005	0.00034	0.5	0.059
Cadmium[1]	0.005	0.00087	0.5	0.054
Calcium	0.2	0.049	20	1.25
Chromium[1]	0.005	0.0022	0.5	0.2
Cobalt[1]	0.005	0.0016	0.5	0.14
Copper[1]	0.01	0.0021	1.	0.19
Iron[1]	0.2	0.045	20	4.89
Lead[3]	0.003	0.0012	1.	0.08
Magnesium	0.1	0.018	10	1.98
Manganese[1]	0.005	0.00051	0.5	0.038
Mercury[2]	0.0002	0.00016	0.1	0.0028
Nickel[1]	0.01	0.0038	1.	0.2
Potassium	0.5	0.043	50	3.72
Selenium[1]	0.01	0.0047	1.	0.47
Silver[1]	0.005	0.0018	0.5	0.15
Sodium	1.	0.46	100	47.2
Thallium[3]	0.01	0.0074	2.	0.16
Vanadium[1]	0.005	0.0017	0.5	0.16
Zinc[1]	0.005	0.0041	2.	0.18
Cyanide, total[4]	0.005	0.01	0.18	0.5

[1]Analyzed by Trace ICP

[2]Analyzed by Cold Vapor

[3]Analyzed by GFAA

[4]Analyzed by automated spectrophotometer

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis, will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQs and MDLs are evaluated annually and subject to change.

Quantitation Report (OT Reviewed)

Data File : C:\HPCHEM\1\DATA\060127\D1060127.D
Acq On : 27 Jan 2006 2:37 pm
Sample : CCC - 50 ppb
Misc : w,5,
MS Integration Params: MARK.P
Quant Time: Jan 30 16:04 2006 Quant Results File: 01118260.RES

Table 5
8260 Surrogate List

Quant Method : C:\HPCHEM\1\METHODS\01118260.M (RTE Integrator)
Title : Ciba 8260 METHOD
Last Update : Wed Jan 11 15:17:54 2006
Response via : Initial Calibration
DataAcq Meth : 01118260

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) Pentafluorobenzene	14.73	168	883530	50.00	ug/L	-0.12
31) 1,4-Difluorobenzene	17.38	114	1311876	50.00	ug/L	-0.11
50) Chlorobenzene-d5	25.08	117	1130757	50.00	ug/L	-0.11
62) 1,4-Dichlorobenzene-d4	31.11	152	644627	50.00	ug/L	-0.10
System Monitoring Compounds						
26) Dibromofluoromethane **sur	15.21	113	484919	51.39	ug/L	-0.11
Spiked Amount 50.000			Recovery =	102.78%		
43) Toluene-d8 **surr**	21.26	98	1422247	50.49	ug/L	-0.12
Spiked Amount 50.000			Recovery =	100.98%		
49) 4-Bromofluorobenzene **sur	28.10	95	627603	44.90	ug/L	-0.10
Spiked Amount 50.000			Recovery =	89.80%		
Target Compounds						Qvalue
2) Dichlorodifluoromethane	5.41	85	505959	43.51	ug/L	93
3) Chloromethane	5.97	50	498072	36.42	ug/L	97
4) Vinyl Chloride	6.20	62	205375	35.02	ug/L	92
5) Bromomethane	7.25	96	183524	30.36	ug/L	94
6) Chloroethane	7.41	64	229915	33.92	ug/L	98
7) Trichlorofluoromethane	8.04	101	439909	35.52	ug/L	100
8) Diethyl Ether	8.71	59	397544	43.60	ug/L	99
9) Acetone	9.24	43	214228	40.81	ug/L	92
10) 1,1-Dichloroethene	9.62	96	363512	48.58	ug/L	98
11) Methyl Iodide	10.49	142	599792	49.10	ug/L	96
12) Allyl Chloride	10.55	41	700960	45.06	ug/L	97
13) Carbon Disulfide	11.04	76	1536074	49.63	ug/L	100
14) Methylene Chloride	10.84	84	480074	46.44	ug/L	94
15) Acrylonitrile	11.12	52	292124	80.43	ug/L	98
16) Methyl-t-butyl Ether	11.19	73	1129886	43.66	ug/L	96
17) trans-1,2-Dichloroethene	11.63	96	450625	48.44	ug/L	97
18) 1,1-Dichloroethane	12.71	63	792356	46.83	ug/L	97
19) 2-Butanone	13.71	43	204243m	36.80	ug/L	
20) Propionitrile	13.90	54	617839m	379.73	ug/L	
21) 2,2-Dichloropropane	14.15	77	666967	47.58	ug/L	94
22) cis-1,2-Dichloroethene	14.26	96	483963	47.93	ug/L	96
23) Methacrylonitrile	14.41	67	168185	41.22	ug/L	94
24) Methyl Acrylate	14.43	55	408990	41.19	ug/L	99
25) Chloroform	14.66	83	824786	46.10	ug/L	95
27) Bromochloromethane	15.11	128	263709	48.74	ug/L	98
28) Tetrahydrofuran	15.17	71	91215	75.32	ug/L	87
29) 1,1,1-Trichloroethane	15.71	97	654545	48.41	ug/L	95

Surrogate

(#) = qualifier out of range (m) = manual integration

Quantitation Report (QT Reviewed)

Table 6
8270 Surrogate List

Data File : C:\HPCHEM\1\DATA\060127\SS060127.D
Acq On : 27 Jan 2006 6:39 pm
Sample : Second Source Known - 60 ng/uL
Misc :
MS Integration Params: rteint.p
Quant Time: Jan 30 9:14 2006 Quant Results File: 01278270.RES

Quant Method : C:\HPCHEM\1\METHODS\01278270.M (RTE Integrator)
Title : Ciba 8270/525.2 METHOD
Last Update : Mon Jan 30 09:06:16 2006
Response via : Initial Calibration
DataAcq Meth : 01278270

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Dichlorobenzene-d4	12.55	152	935394	40.00	ng/uL	-0.01
19) Naphthalene-d8	15.16	136	3799775	40.00	ng/uL	-0.01
34) Acenaphthene-d10	18.79	164	2207099	40.00	ng/uL	-0.01
55) Phenanthrene-d10	21.90	188	3669965	40.00	ng/uL	-0.01
67) Chrysene-d12	27.64	240	2706726	40.00	ng/uL	-0.02
77) Perylene-d12	33.01	264	1303831	40.00	ng/uL	-0.02
System Monitoring Compounds						
4) 2-Fluorophenol **surr**	10.09	112	5983775	198.01	ng/uL	-0.01
Spiked Amount 200.000			Recovery = 99.01%			
5) Phenol-d6 **surr**	11.99	99	8767187	201.30	ng/uL	-0.01
Spiked Amount 200.000			Recovery = 100.65%			
20) Nitrobenzene-d5 **surr**	13.74	82	4351408	93.48	ng/uL	-0.01
Spiked Amount 100.000			Recovery = 93.48%			
38) 2-Fluorobiphenyl **surr**	17.37	172	7639824	93.63	ng/uL	0.00
Spiked Amount 100.000			Recovery = 93.63%			
54) 2,4,6-Tribromophenol **sur	20.48	330	1373053	199.88	ng/uL	0.00
Spiked Amount 200.000			Recovery = 99.94%			
70) Terphenyl-d14 **surr**	25.16	244	7225397	92.22	ng/uL	0.00
Spiked Amount 100.000			Recovery = 92.22%			
Target Compounds						Qvalue
2) N-Nitrosodimethylamine	6.90	42	859482m	57.09	ng/uL	
3) Pyridine	6.93	79	1542562m	56.14	ng/uL	
6) Phenol	12.01	94	2553021	56.11	ng/uL	75
8) bis (2-Chloroethyl) ether	12.03	93	2232442	54.76	ng/uL	94
9) 2-Chlorophenol	12.23	128	1736937	53.88	ng/uL	99
10) 1,3-Dichlorobenzene	12.43	146	2022127	56.25	ng/uL	98
11) 1,4-Dichlorobenzene	12.59	146	2037690	56.33	ng/uL	99
12) Benzyl Alcohol	12.94	108	1072847	56.57	ng/uL	93
13) 1,2-Dichlorobenzene	12.90	146	1850136	56.21	ng/uL	98
14) 2-Methylphenol	13.16	107	1408168	53.78	ng/uL	98
15) bis (2-Chloroisopropyl) et	13.08	45	2719279	56.01	ng/uL	98
16) 4-Methylphenol	13.49	107	2030351	53.14	ng/uL	99
17) N-Nitrosodi-N-propylamine	13.42	70	1420639	55.03	ng/uL	96
18) Hexachloroethane	13.55	117	896906	56.03	ng/uL	99
21) Nitrobenzene	13.77	77	2188175m	55.44	ng/uL	
22) Isophorone	14.28	82	3684602	54.40	ng/uL	99
23) 2-Nitrophenol	14.40	139	1048752	54.18	ng/uL	99
24) 2,4-Dimethylphenol	14.52	122	1585077	54.84	ng/uL	96
25) bis (2-Chloroethoxy) metha	14.64	93	2340927	55.65	ng/uL	100

(#) = qualifier out of range (m) = manual integration

ATTACHMENTS

ATTACHMENT #1

7.1 CPS/Madison Groundwater Contaminant Distribution Characterization

7.1.1 Purpose

The purpose for this Section is to provide a characterization of the groundwater contamination attributable to the CPS/Madison Site based on available local and regional hydrogeological and water quality data. With this information, the effectiveness of the pump-and-treat systems is also assessed.

7.1.2 Implementation

The first step is to compile a characterization database. The following information was compiled:

1. Regional GIS (NJ and USGS internet archives)
    - Topographic maps
    - Air photos
    - Watersheds
    - Surface water (streams, lakes, wetlands)
    - Land use

2. Existing historical Site-related documentation
    - Evor Philips Leasing Company (EPLC) Site Data
        i. Supplemental GW RI Report (5/2004)
        ii. NPL Site Amendment No. 1 (5/2005)

    - CPS/Ciba (CPS) Site Data
        1. RI Reports (Phase 1, 1/94 and Phase 2, 5/96)
        2. PMP reports (WQ from 1991 to 2004).
        3. Natural Attenuation Report (2002)

    - Madison Industries (MI) Site Data
        i. RI Report (9/96)
        ii. PMP reports (WQ from 1997 to 12/2004 [report 55])

In addition to these historical documents, the following recently compiled data was included:

3. Conduct special characterization sampling (Ciba)
    - Geoprobe profiling VOC (5/03 and 7/05)
    - Metals and VOC at monitoring wells not currently on SAMP (on and off CPS property) [12/04 and 3/05]

These data were combined using visualization software to derive plume impact zones (plan view and depth) based on

- Regional flow (regional GIS, water supply pumping).
- Local flow, based on water level data and pump well locations and extraction rates.
- Locations of source areas.
- Spatial and temporal trends in water quality at monitoring wells.

7.1.3 Hydrogeology

For the purposes of this discussion, the aquifer associated with the contaminant plume is assumed to be relatively homogeneous and unconfined, consisting of unconsolidated sands, silts and clays (see Section 3.2).

Figure 1 shows the Site relative to the regional topography. Note that there is a topographic high to the north and west of the Site, and the slope drops along the principle drainage-way (toward Tennent Pond). Figure 2 presents the implied regional surface water and groundwater flow patterns based on GIS watershed boundary and surface water drainage layers, and the locations of the Perth Amboy water supply wells (PA-series). Note that the natural groundwater flow direction away from the CPS/Madison Site is along the Prickets Brook drainage way. The Perth Amboy supply wells, pumping at a rate of approximately 2.5 million gallons per day, are shown to skew the flow lines off their natural path. Data supporting this feature are discussed below.

An important component for understanding past and present contaminant distribution is a characterization of aquifer stress conditions (e.g., pumping wells and surface water) over time. Figure 3 provides a summary of 'early' stress conditions. It shows what can be considered the first-generation pump-and-treat well configuration (see Section 2.2.4). Figure 4 shows the current pumping stress configuration. These are the regional wells that are assumed to have influence on contaminant distribution in groundwater.

By combining the data shown in Figures 1 through 4, with the water level data from the CPS/Madison PMP and the EPLC monitoring program, a regional groundwater flow net can be drawn (Figure 5). This flow net is assumed to be relatively constant given the current stress configuration.

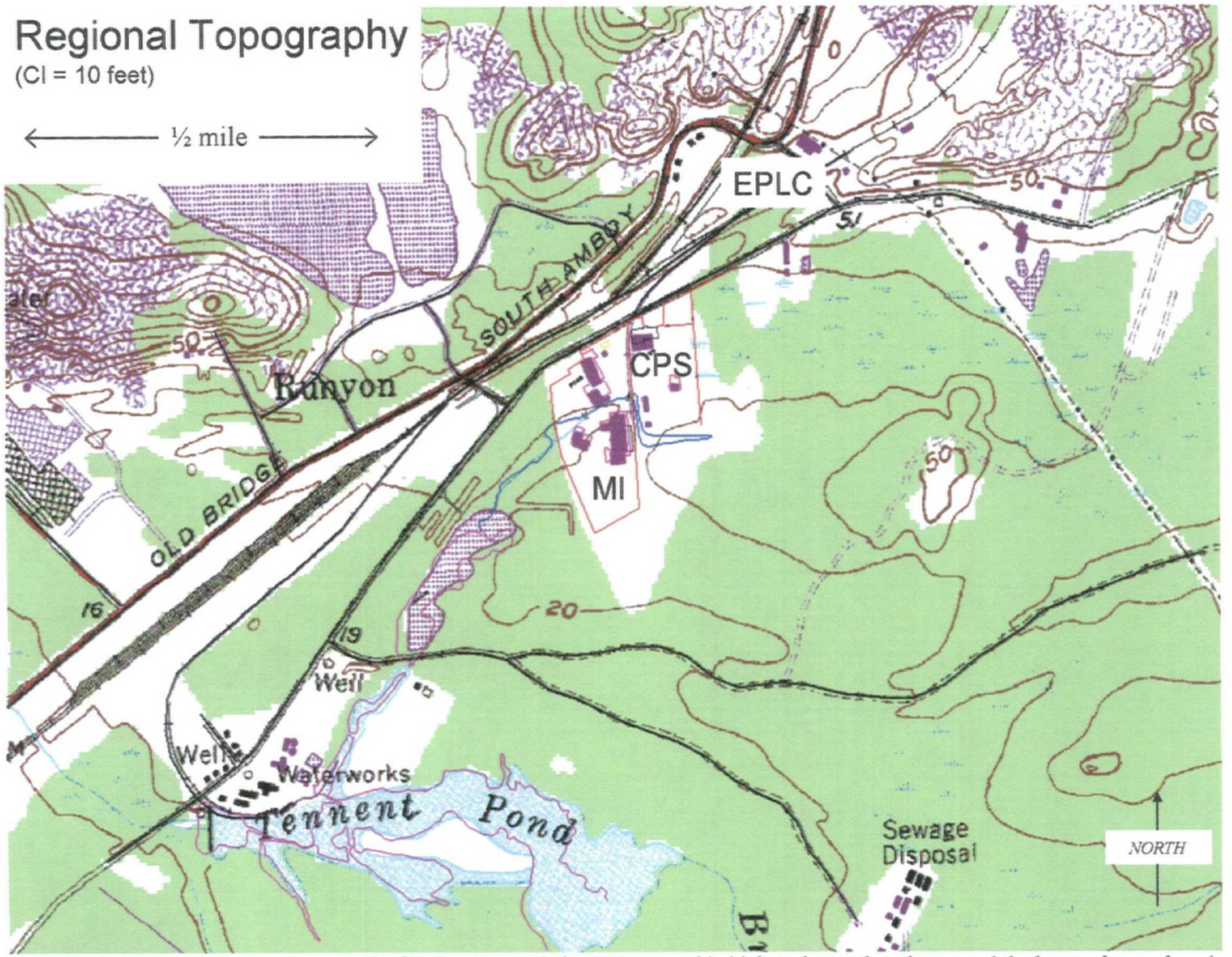


Figure 1 – USGS topographic map showing the Site locations relative to topographic high to the north and west and the low to the south and east.

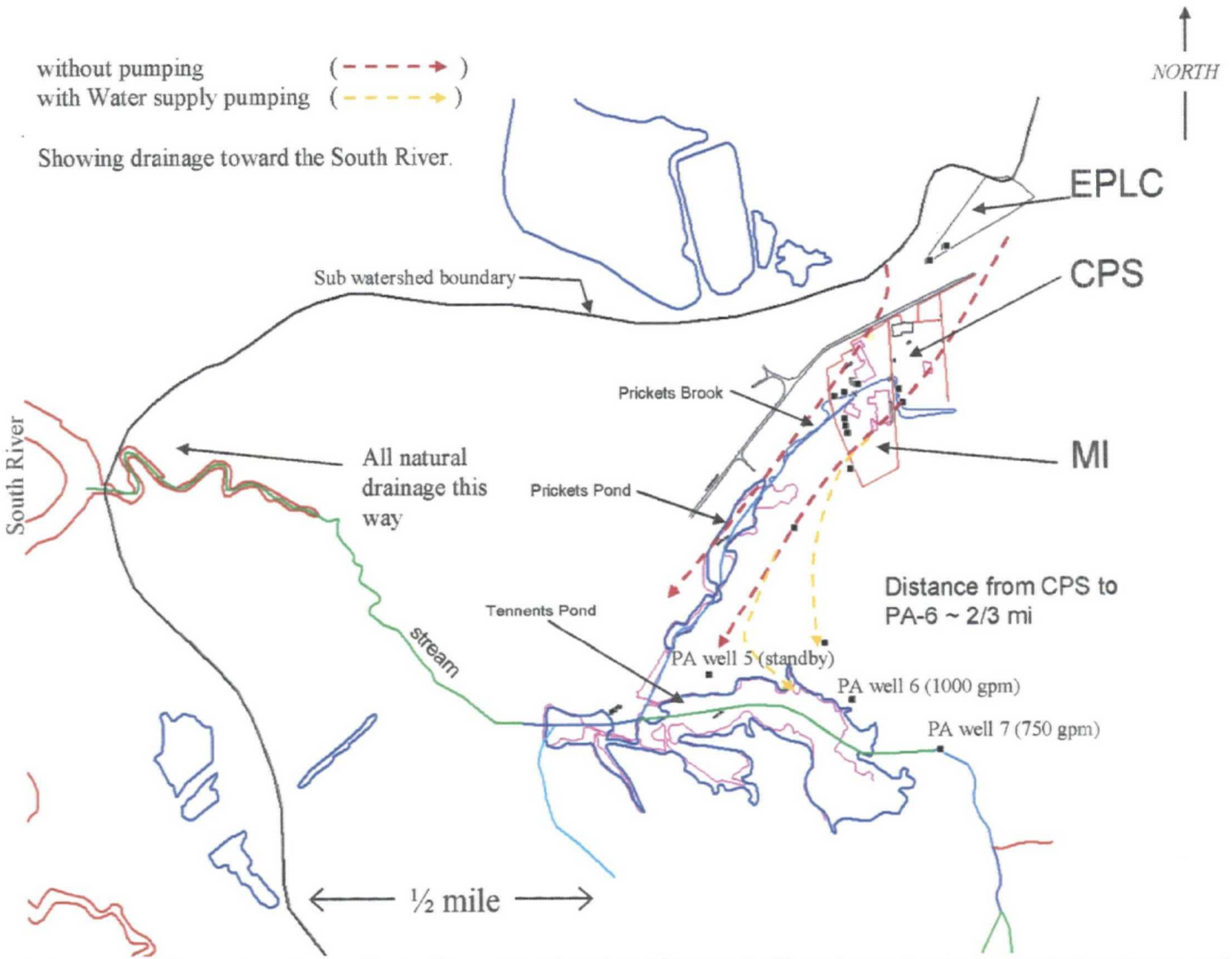


Figure 2 – Implied regional surface water and groundwater flow patterns based on GIS watershed boundary and surface water drainage layers, and the locations of Public Supply wells (PA-series). The blue, red and green lines represent surface water expression.

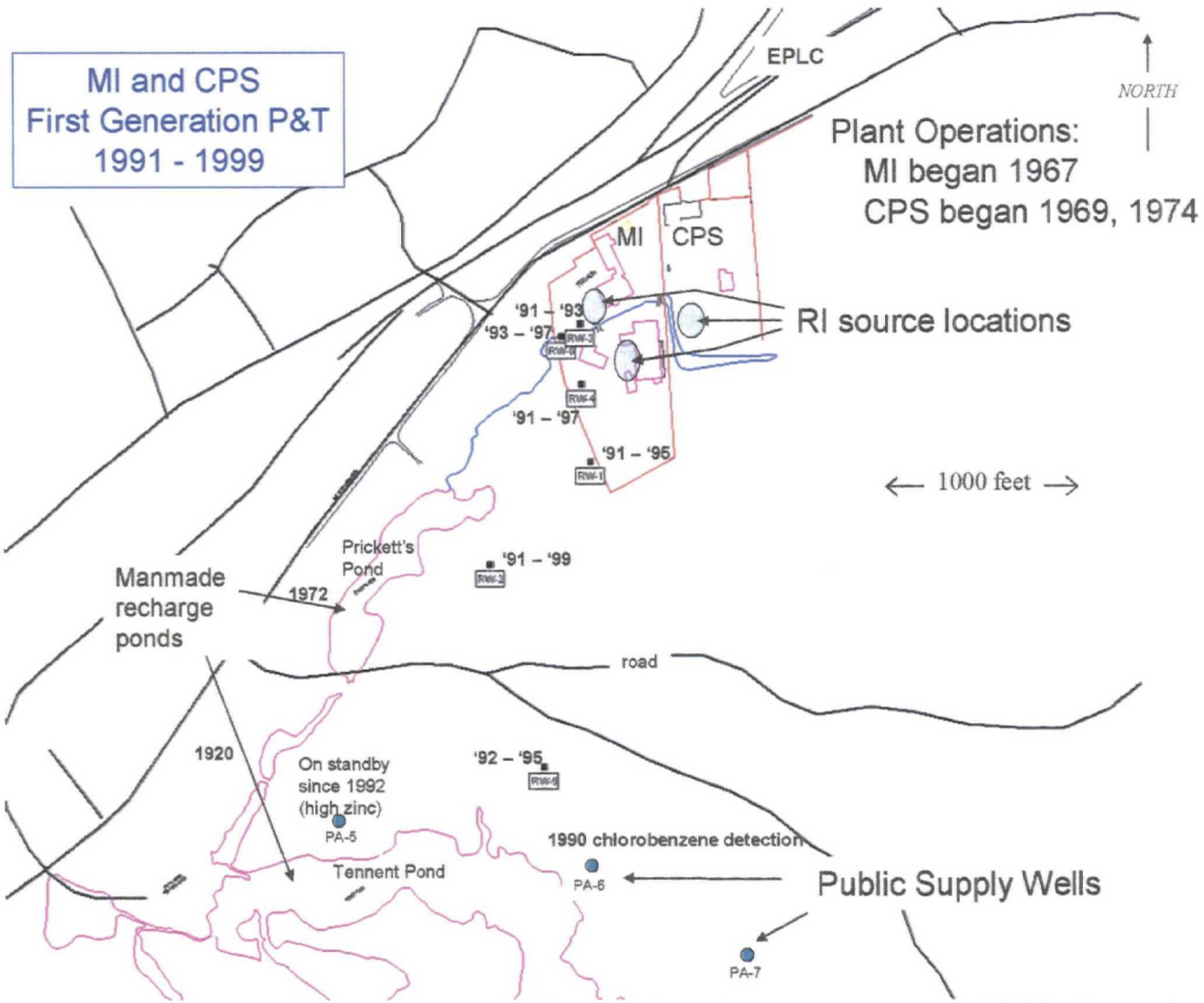


Figure 3 – Historical aquifer stress conditions, 1991 to 1999. The dates of operation for each remediation pumping well (RW-series) are shown. Some relevant site history is also provided.

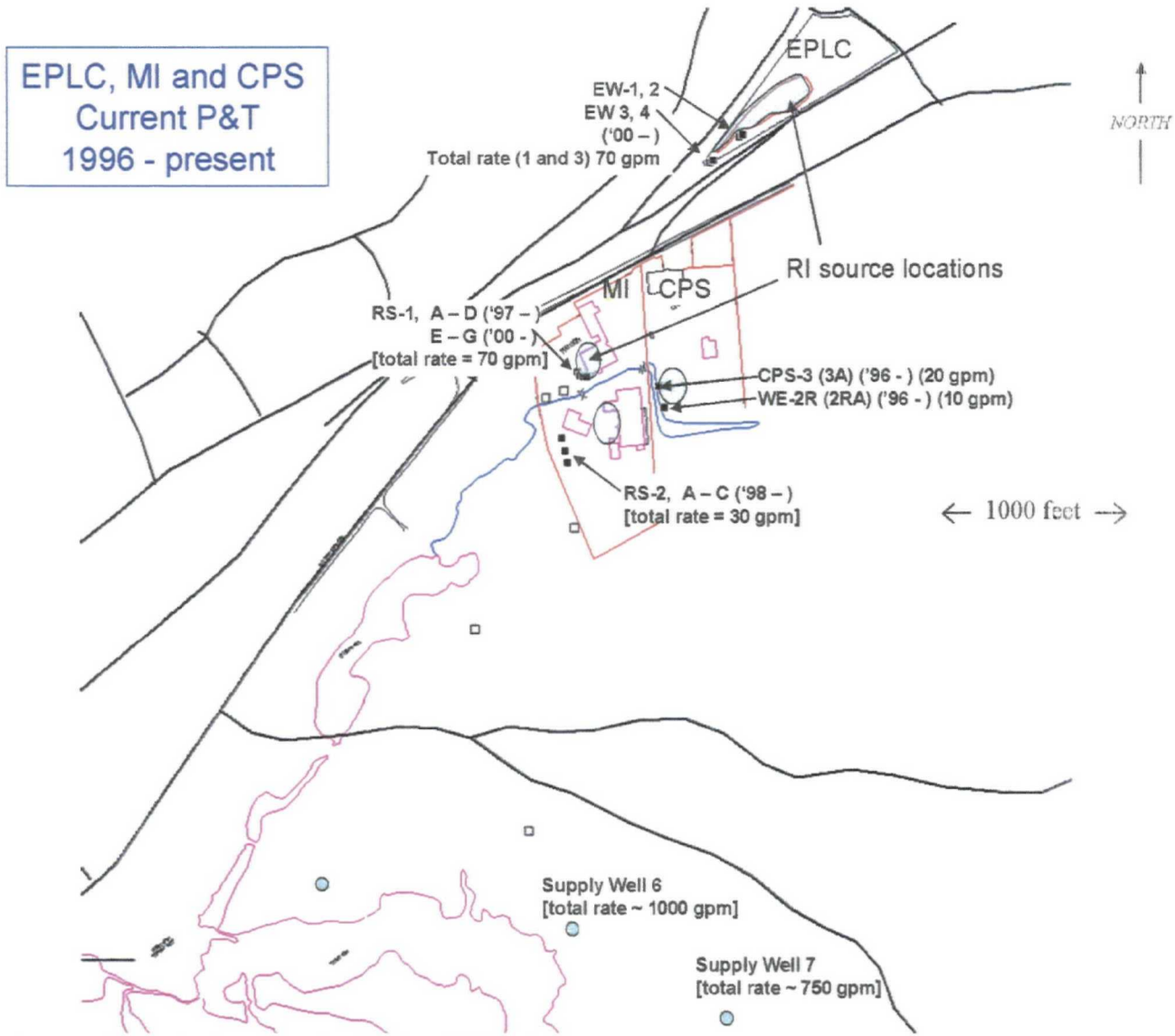


Figure 4 - Aquifer stress conditions that have been in play from 1996 to the present.

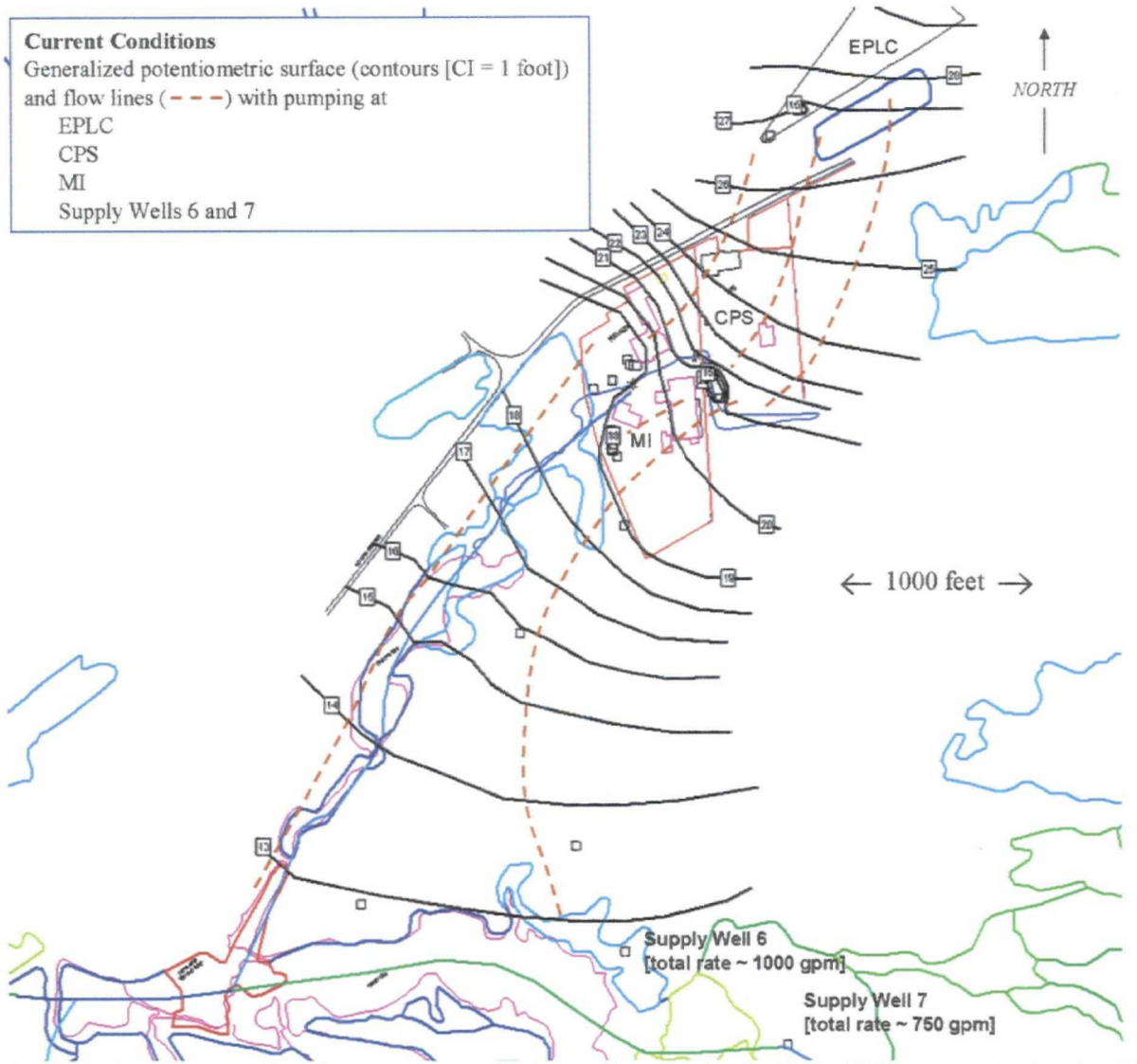


Figure 5 – Generalized potentiometric surface map based on recent water level sampling associated with the PMP program, and regional flow conditions presented in Figure 2. The blue, red and green lines represent surface water expression.

7.1.4 Identify site-Specific Compounds

As shown in Figures 5 and 6, groundwater contamination at and downgradient of the CPS/Madison Site is the result of contaminant source and transport conditions associated with three independent sites located along the regional groundwater flow lines. These sites are, from upgradient to downgradient: EPLC, CPS and MI.

From analysis of the Site-specific water quality databases available form RI and PMP reports, the following site-specific compounds have been identified:

- Madison Industries - Metals
  - Zinc
  - Copper
  - Lead
  - Cadmium
- CPS – Volatile Organic Compounds (VOCs)
  - Chlorobenzene (CB)
  - Dichlorobenzene (DCB)
  - BTEX
- EPLC - VOCs
  - 1,2-Dichloroethane (12DCA)
  - Methylene Chloride (MeCl)
  - TCE
  - cis-1,2-Dichloroethylene (cis-12DCE)

Note that both EPLC and CPS are characterized based on VOC contamination, while MI is characterized based on metals contamination.

7.1.5 VOC-Plume Characterization

The total VOC plume (TVOC) at and downgradient of the CPS/Madison Site is generally the sum of the contribution from both the EPLC and CPS Sites (Figure 6). Figure 7 shows an interpretation of the TVOC plume at the site level based on source area, hydrologic and water quality data (2004 CPS data and 2003 EPLC data). The plume appears to be 30 to 50 feet below ground surface (BGS).

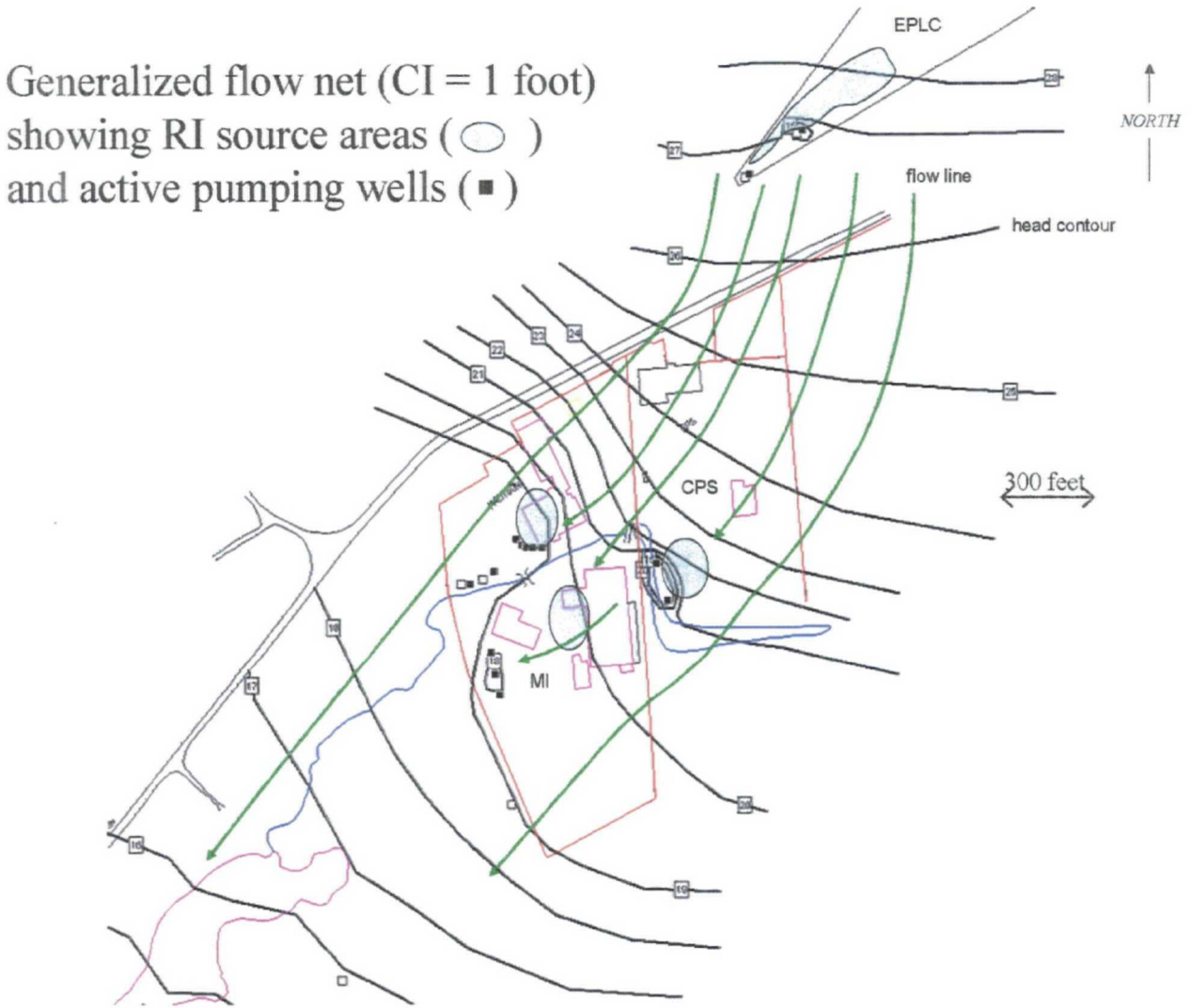


Figure 6 – Ground water flow net based on site-specific data and an interpretation of regional flow patterns, showing the hydraulic connection of the three sites affecting groundwater quality.

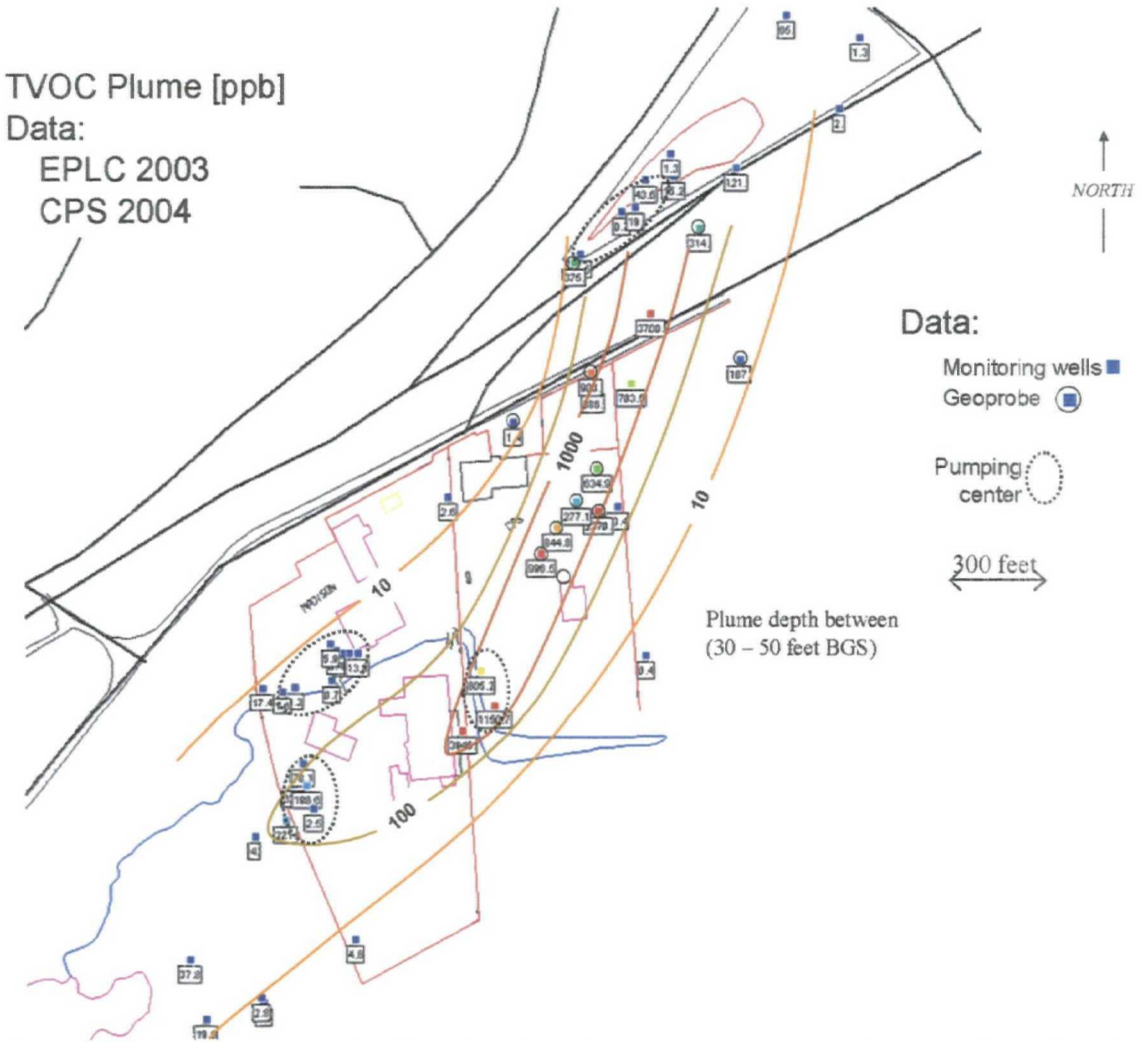


Figure 7 – Interpretation of the total VOC plume at the site level based on data relevant to source area location, groundwater flow direction, water quality. The TVOC data shown are form recent groundwater monitoring (wells and geoprobe).

To understand the contribution to groundwater contamination from the CPS site, consider the 'fingerprint' compounds identified in the previous section. Figure 8 provides a representation of the data, where the TVOC concentration was normalized by the sum of the EPLC compounds identified (12DCA, MeCl, TCE, cis-12DCE). If data points >90% are indicative of EPLC mass, and the groundwater flow field is well characterized, then it is clear that the CPS plume emanates from the general source area location shown, and that mass upgradient and side-gradient of this source area are attributable to EPLC. This conclusion is further enforced by plotting the 12DCA and CB plumes (Figures 9 and 10, respectively), where the 12DCA plume is attributed to EPLC and the CB plume is attributed to CPS. The plumes do not overlap except at and downgradient of the CPS source area.

The CPS plume can be further characterized by first characterizing near-field data and then characterizing far-field, downgradient, data. Figure 11 provides recent CB data just downgradient of the CPS source area. The plot shows the CB result at monitor well CPS-1 over time. It is interesting to note that the concentration increased after the pumping well, WE-2R was moved about 15 feet north and east (WE-2RA) because of operation problems. Note that the new well pumps at twice the rate as the former (~15 GPM versus ~7 GPM). To investigate this observation further, a geoprobe transect was taken along the CPS-1 side of the drainage ditch that separates the CPS onsite pumping center (CPS-3A and WE-2RA) from the downgradient transport direction. The results are summarized in Figure 12. Significant mass of CB, DCB and benzene was found to occur at least 50 feet on either side of CPS-1. This mass had limited extent vertically, located between 25 and 35 feet below ground surface.

To facilitate comparison of the CPS-1 data with that associated with the pumping wells, CPS-3A and WE-2RA, Figure 12 provides water quality time-history plots for the pumping wells. While the composition of the mass is similar across the drainage ditch, the magnitude is not. Thus, it is not clear whether the mass observed at CPS-1 is due to incomplete capture of the characterized source area or there is source material downgradient of the pump-and-treat capture envelope.

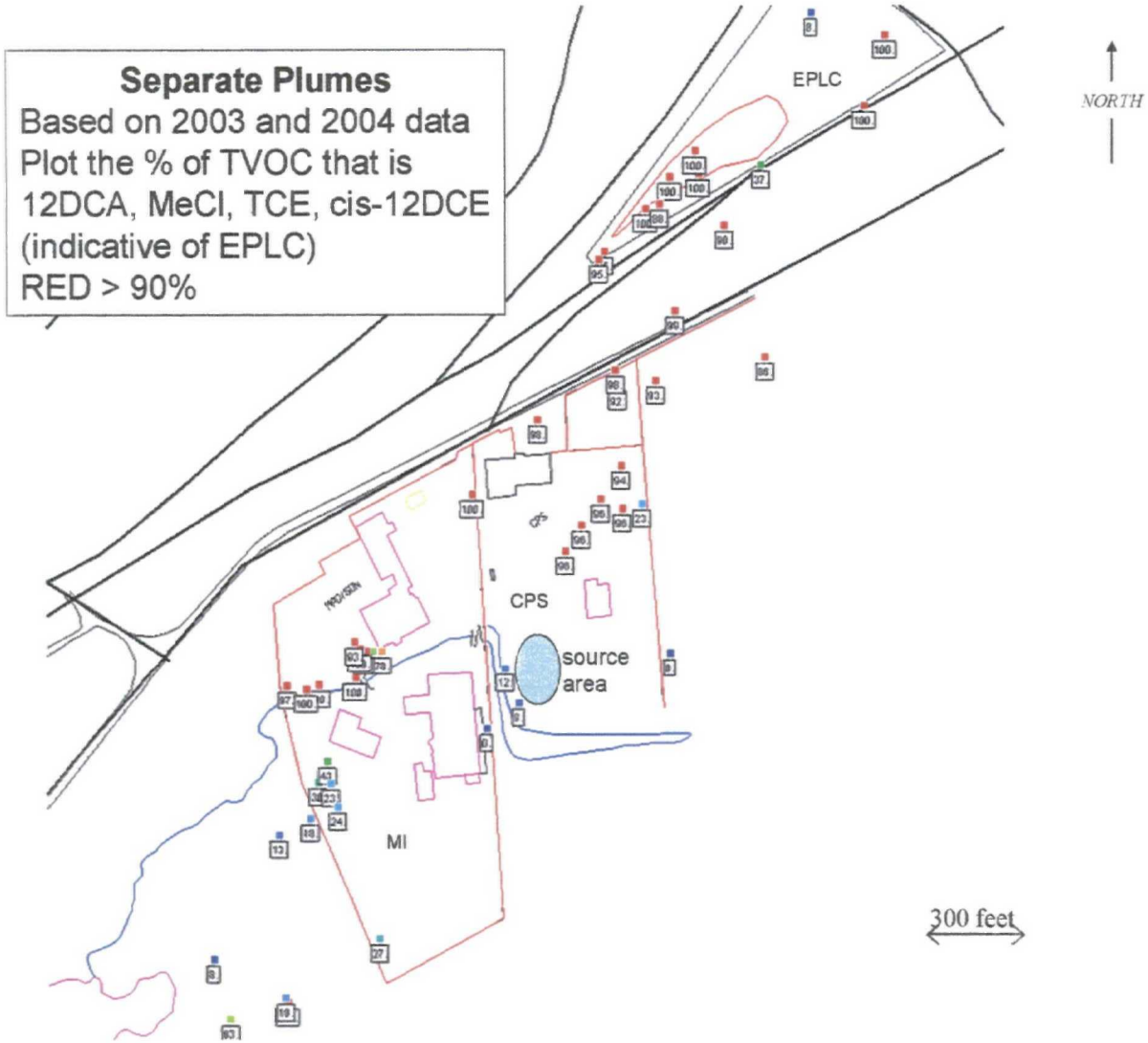


Figure 8 - In an effort to separate the EPLC and CPS contributions to groundwater contamination, the TVOC data used in Figure 7 was normalized by the sum of "EPLC compounds." Red data points (>90% EPLC compounds) are considered part of the EPLC plume.

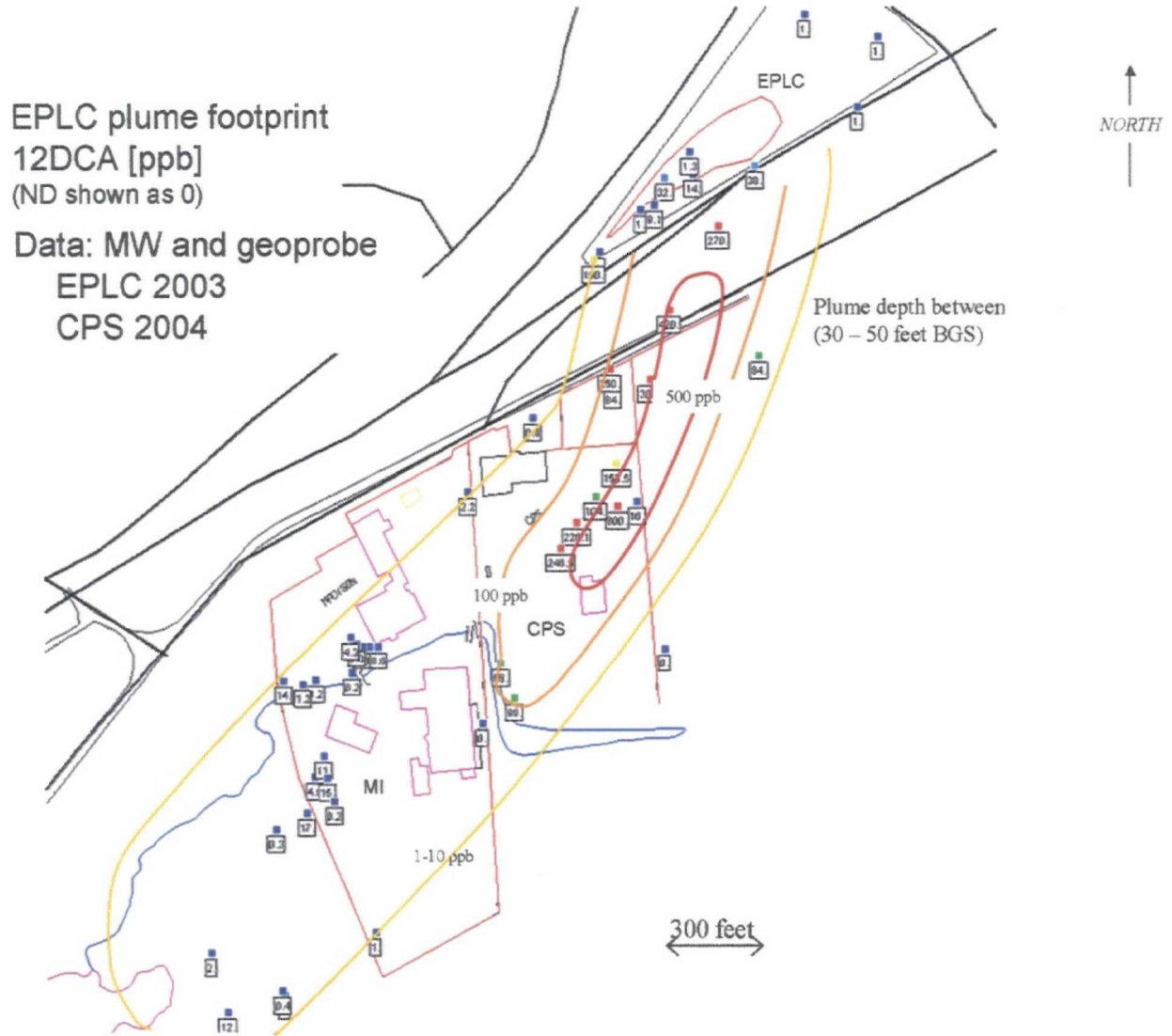


Figure 9 - Interpretation of the 12DCA plume at the site level based on data relevant to source area location, groundwater flow direction, and water quality. The data are the same as were used in Figures 7 and 8.

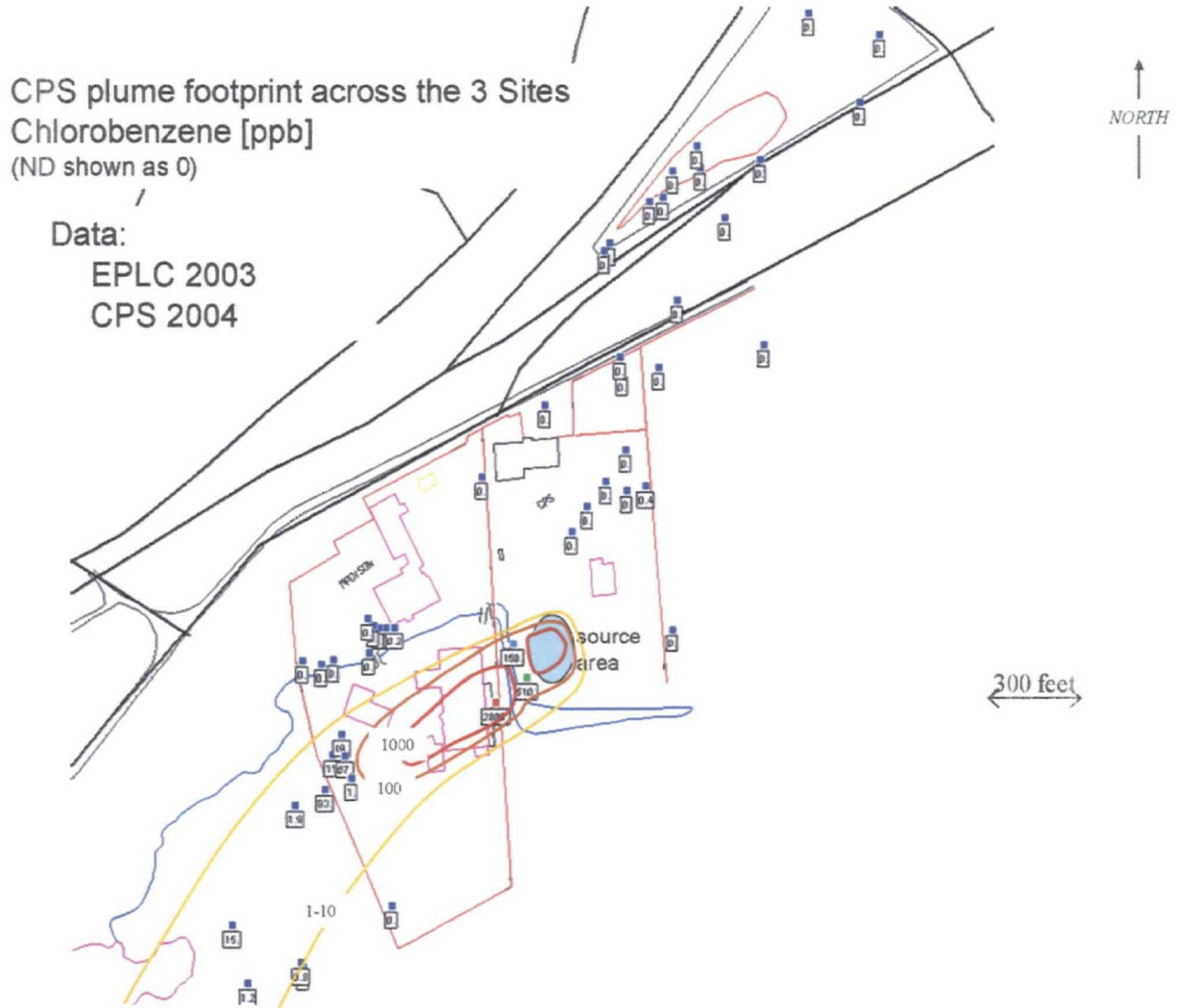


Figure 10 - Interpretation of the CB plume at the site level based on data relevant to source area location, groundwater flow direction, and water quality. The data are the same as were used in Figures 7 and 8.

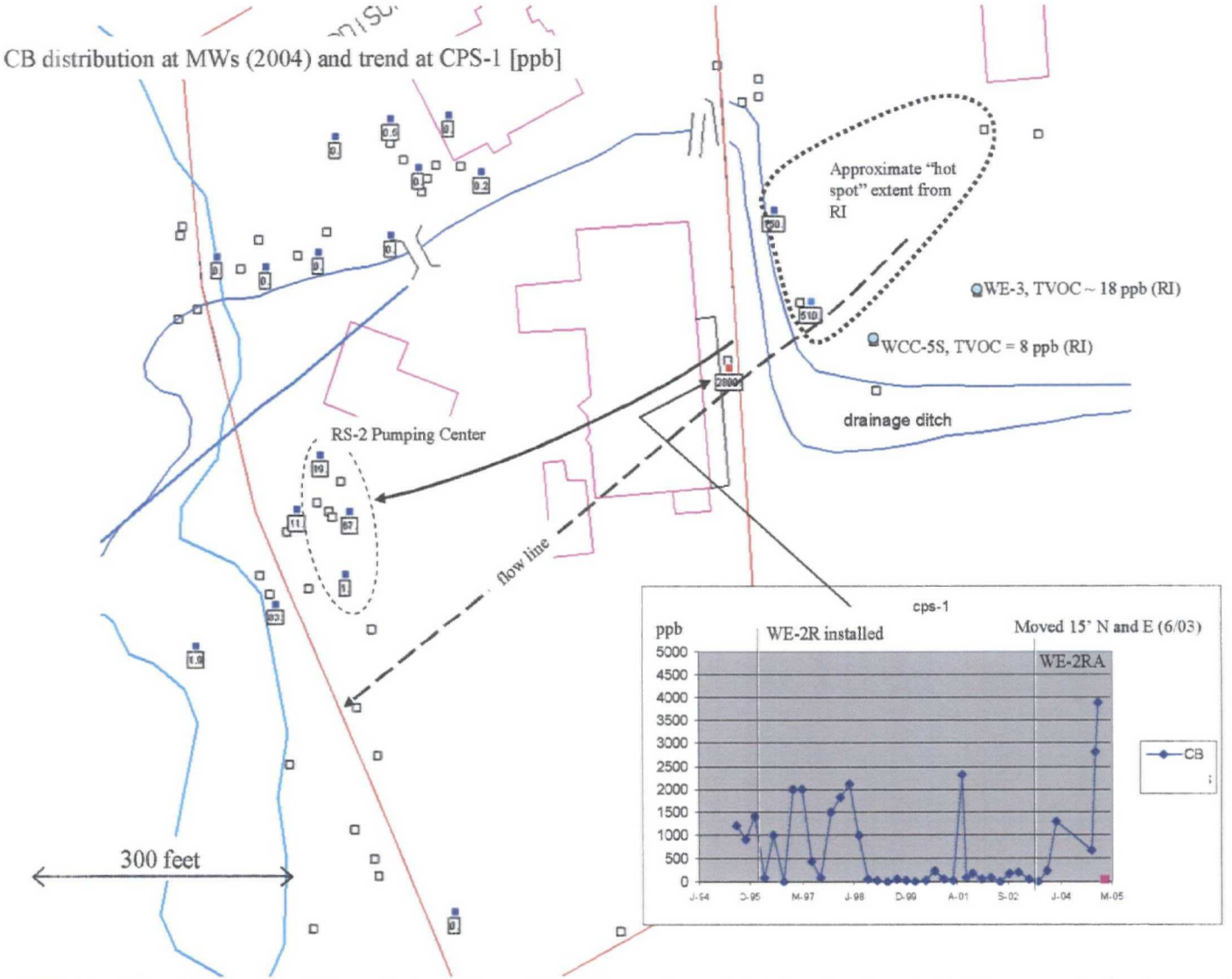


Figure 11 – Local CB data. The plot shows the CB result at monitor well CPS-1 over time. It is interesting to note that the concentration increased after the pumping well, WE-2R was moved (WE-2RA) because of operation problems. The new well pumps at twice the rate as the former (~15 GPM versus ~7 GPM).

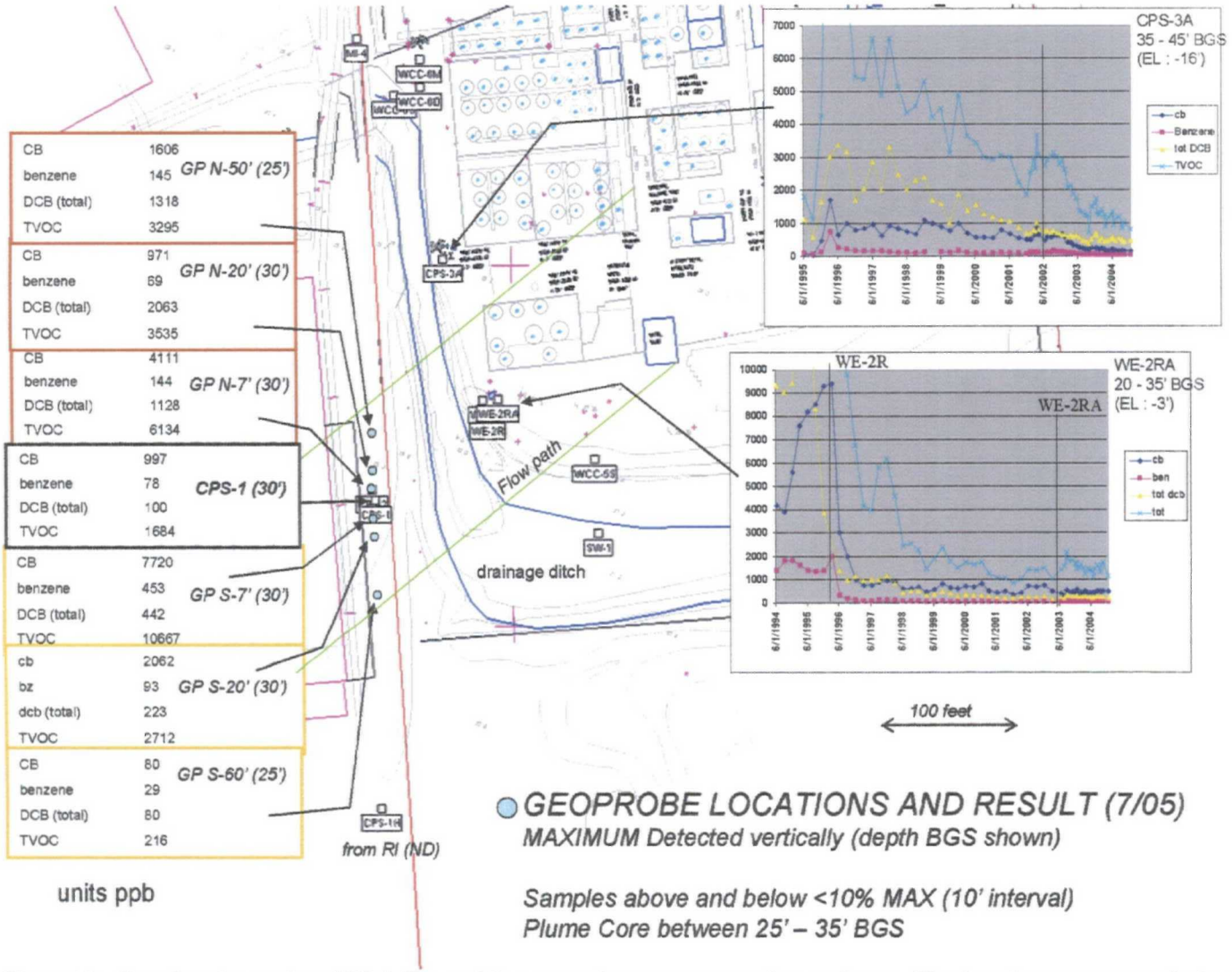


Figure 12 – Based on the result at CPS-1 (Figure 11), a geoprobe transect was taken as shown. The data shown represent the largest detect at each location, and this depth was consistently between 25 and 35 feet BGS. Note, most of the mass consists of CB, DCB and benzene. The water quality time-history at the two pumping wells is also shown. There is clearly a discrepancy in concentration magnitude on either side of the drainage ditch.

Combining the recent monitoring well data with the geoprobe result (Figure 12), a local CB plume map is presented in Figure 13. Note that not all the plume is shown to be captured by the MI pump-and-treat (RS-2A, B, C). This is based primarily on water quality data, where the CB concentration is 67 ppb at RS-2B and 2800 ppb at CPS-1, 500 feet upgradient. However, note that the concentration increase at CPS-1 occurred after 6/03 (see Figure 11), and that data shown in Figure 13 were collected approximately 18 months later. Because the distance between CPS-1 and RS-2B is approximately 500 feet and the groundwater velocity is assumed to be between 0.5 and 1 foot/day, the front associated with the observed increase may have yet to reach the MI pumping center.

A characterization of the flow path and contaminant distribution along the plume length can be achieved by combining time history water quality plots at spatially distributed monitoring points with pumping well operation data. This is because the operation of pumping wells perturbs the hydrologic system (i.e., deflects flow lines), and thus has the potential to affect the water quality monitoring record.

To this end, Figure 14 provides time history TVOC plots for several wells downgradient of the CPS Site. RW-1 is a former pumping well that operated until 1996. Other pumping wells that influence flow in the area are RW-4 and RS-2 (operation interval shown). The trend in contaminant levels can be attributed to effects from pumping, assuming that pumping affects the flow as shown. This interpretation supports the conclusion that the plume has historically been migrating between wells PA-B and WCC-12.

Figure 15 provides a similar analysis further downgradient. RW-2 and RW-5 are former pumping wells, their operation intervals shown. The data support the plume outline shown. The deflection of the plume toward PA-6 (Perth Amboy supply well) and away from the natural drainage (see Figure 5) is due to supply well extraction rates (totaling ~2.5 MGD).

An interpretation of the footprint of the CPS plume as it exists today is shown in Figure 16. This is derived from all the information presented previously. The outline is similar to that presented in the recent CPS PMP reports. The data show that the plume is about 30 feet BGS near the source, and as it travels toward the pumping center, it reaches depths of 60-80 feet BGS (at the elevation of the PA wells).

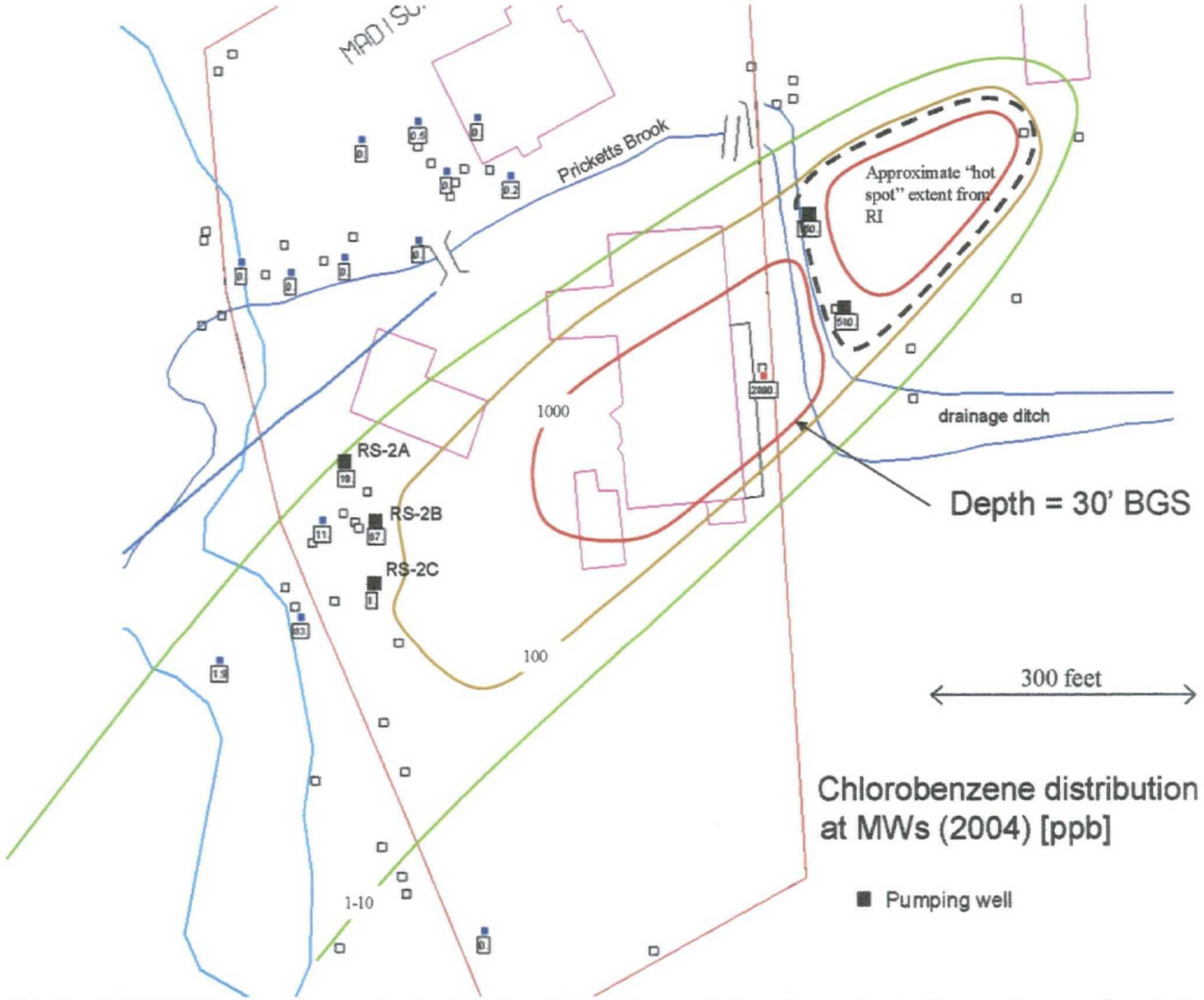


Figure 13 – Local CPS VOC plume characterization based on CB data, interpretation of groundwater flow, and source characterization. This is consistent with that shown in Figure 10.

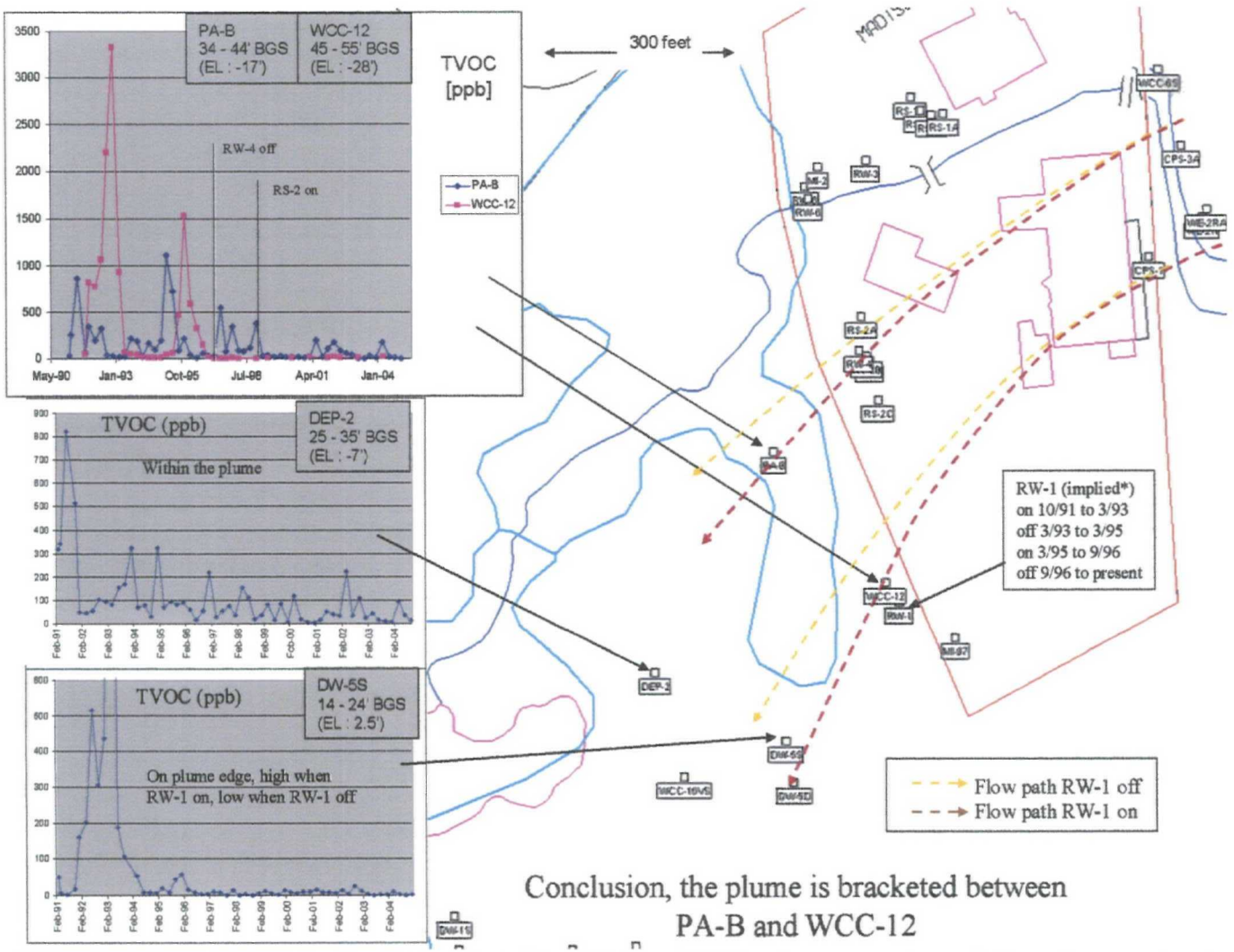


Figure 14 – Time history TVOC plots for several wells downgradient of the CPS Site. RW-1 is a former pumping well (*operation records not available). The trend in contaminant levels can be attributed to effects from pumping, assuming that pumping affects flow as shown. This interpretation supports the conclusion that the plume has historically been migrating between wells PA-B and WCC-12. The operation of pumping wells RW-4 and RS-2 is also indicated.

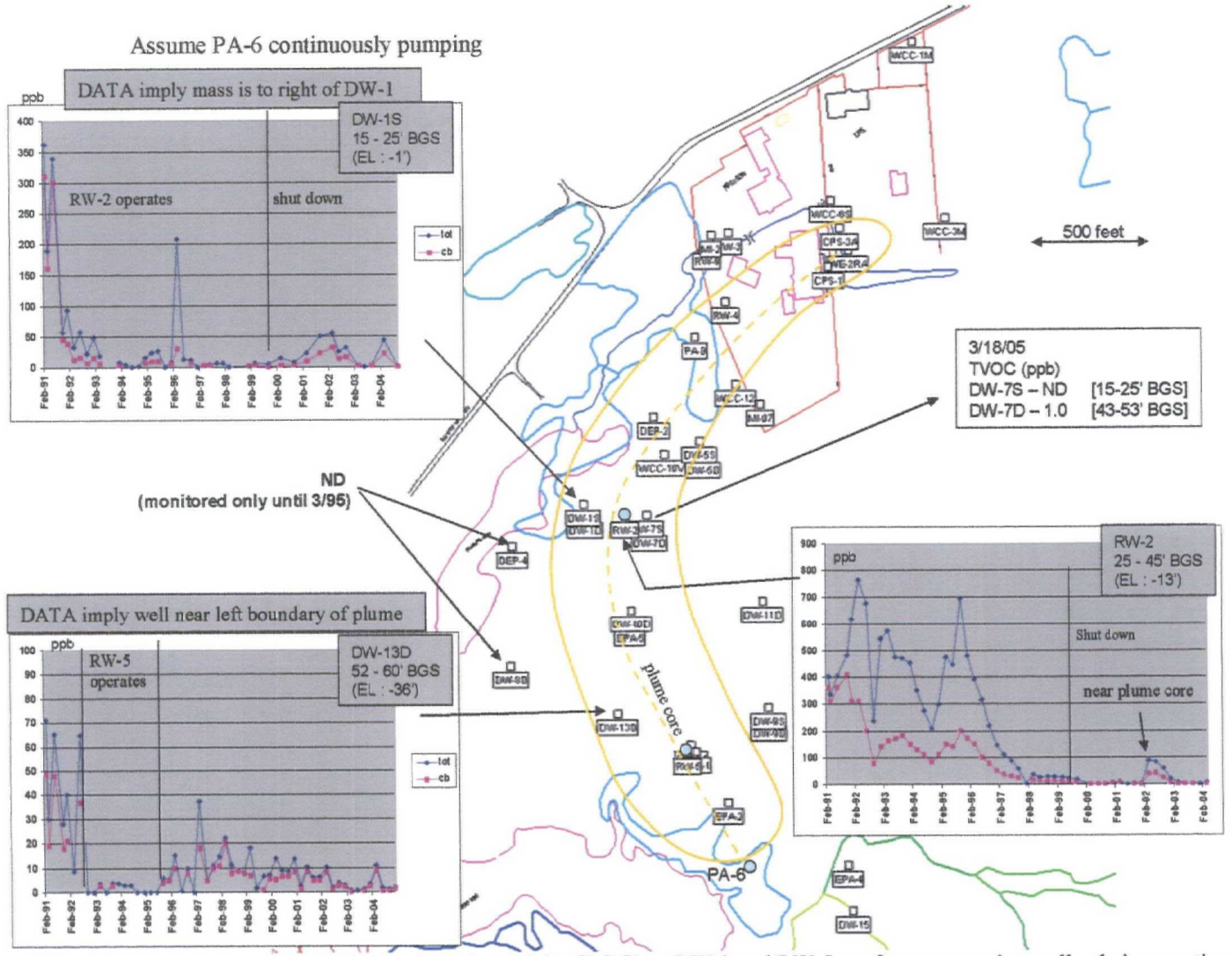


Figure 15 - Time history TVOC plots for several wells downgradient of the CPS Site. RW-2 and RW-5 are former pumping wells, their operation intervals shown. The data support the plume outline shown. The deflection of the plume toward PA-6 (Perth Amboy supply well) and away from the natural drainage (see Figure 5) is due to supply well extraction rates (totaling ~2.5 MGD).

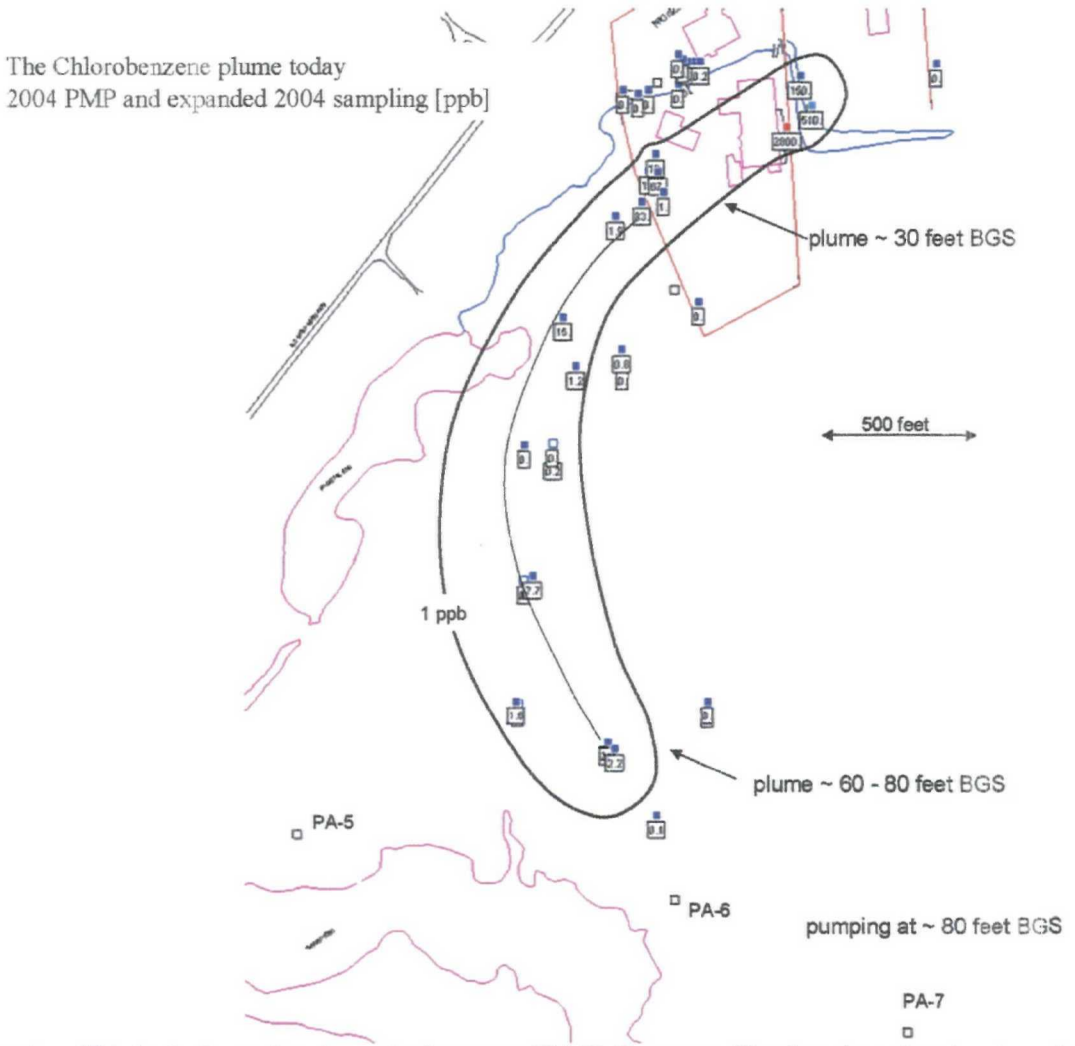


Figure 16 – The CB plume today. This is similar to that shown in the recent CPS PMP reports. The data show that the plume is about 30 feet BGS near the source, and as it travels toward the pumping center, reaches depths of about 80 feet BGS (at elevation of pumping wells).

7.1.6 Metals Plume Characterization

As discussed in Section 4, the metals plume is uniquely associated with the Madison Industries (MI) site. In particular, the following metals are associated with MI source areas: zinc, copper, lead and cadmium. Of these, the database suggests that the MI plume can be characterized by zinc, and copper can be considered a secondary characterization compound.

As with the VOC plume, the metals plume characterization is based on source area, hydrology and water quality data. Figure 17 provides a location map for the potential source areas and the locations of the current pumping system (10 wells). The data is from the 1996 RI report. Figure 18 shows the metals mass at selected extraction wells. Zinc is dispersed across the site, and copper is located predominately on the southern half. These data support the RI source area locations.

Figure 19 shows the occurrence of metals downgradient of the MI site, to the south of the drainage way (Pricketts Brook). While the wells just downgradient of the pumping center show attenuation resulting from capture (PA-B and WCC-11S), the off-axis wells do not (DEP-2, MI-7 and WCC-5S).

Figure 20 shows the available zinc data downgradient of the MI site, along the Pricketts Brook and Pond drainage way. While there has been marked attenuation at the far downgradient well (KA-1S), attenuation at the other wells is less clear, mainly because data are sparse. Note that KA-1S is a shallow well (albeit at an unknown depth). The high concentration implies that this well is in a groundwater discharge area.

Finally, putting together the data provided above with the conceptual model for groundwater flow provides the basis for the plume map shown in Figure 21. The distribution is shown as two plumes because of the source area distribution and the potential groundwater divide afforded by the Pricketts Brook.

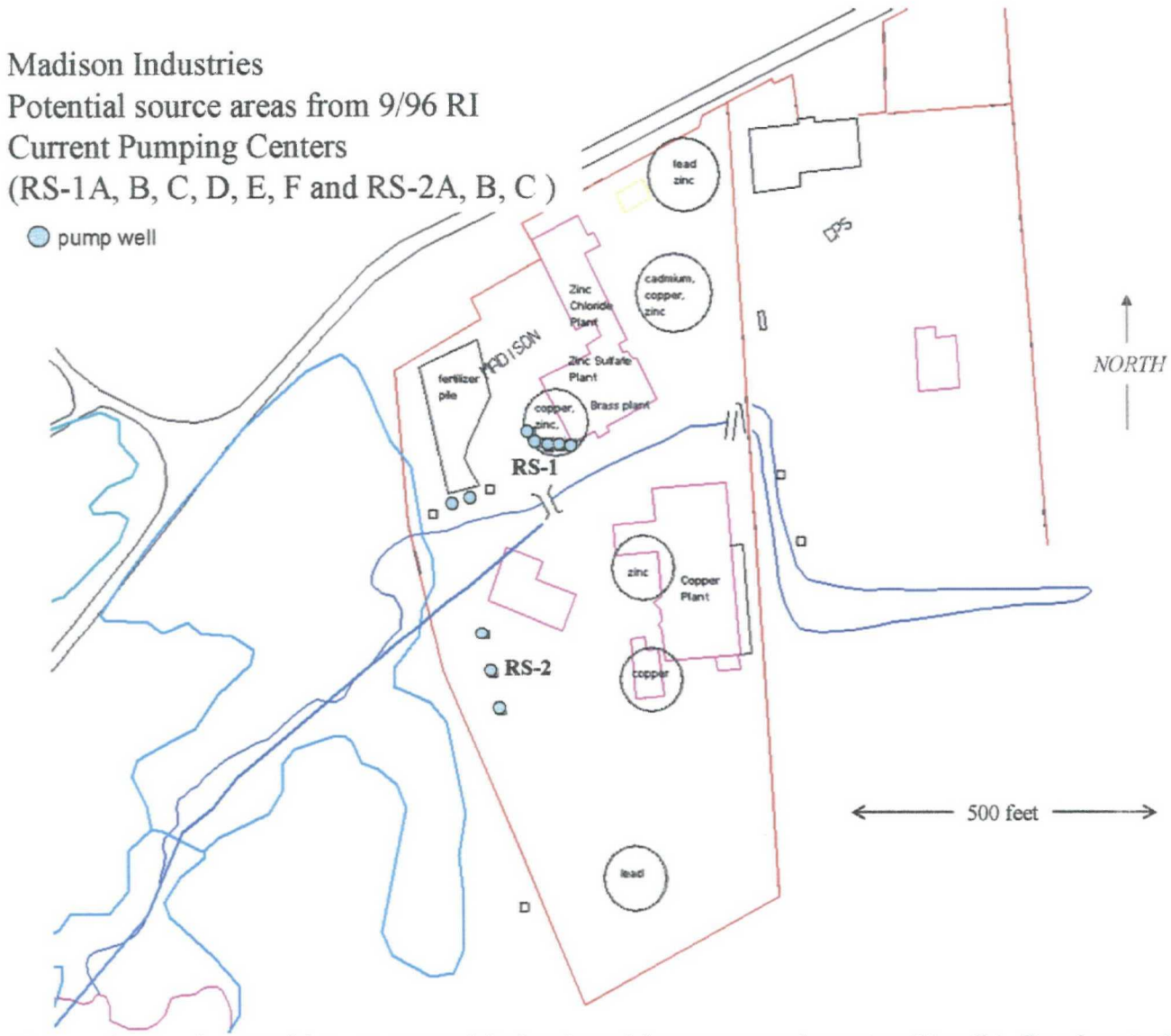


Figure 17 – Location map for potential source areas and the locations of the current pumping system (10 wells). Data form the 1996 RI.

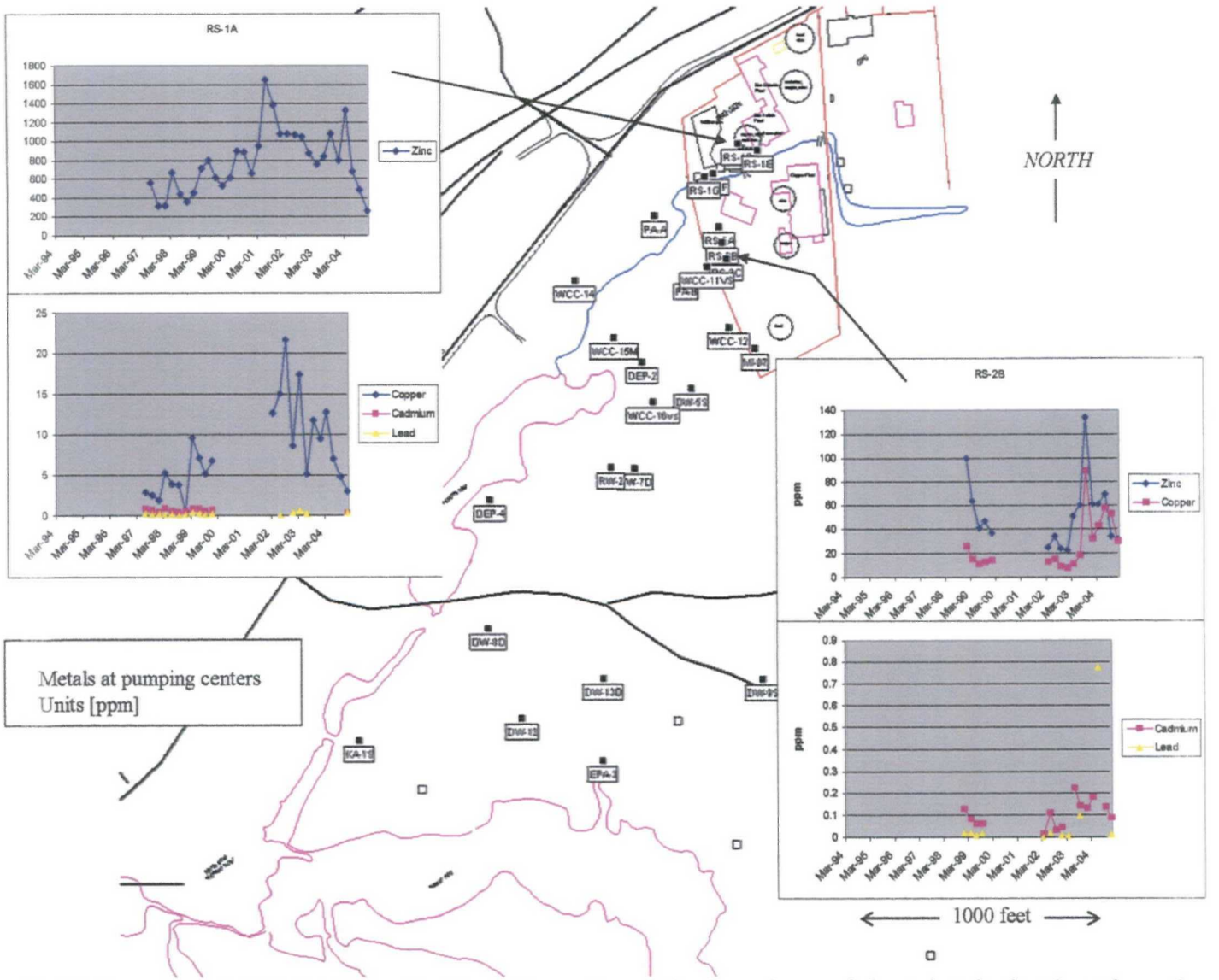


Figure 18 – Metals mass at selected extraction wells. Zinc is dispersed across the site, and copper is located predominately on the southern half.

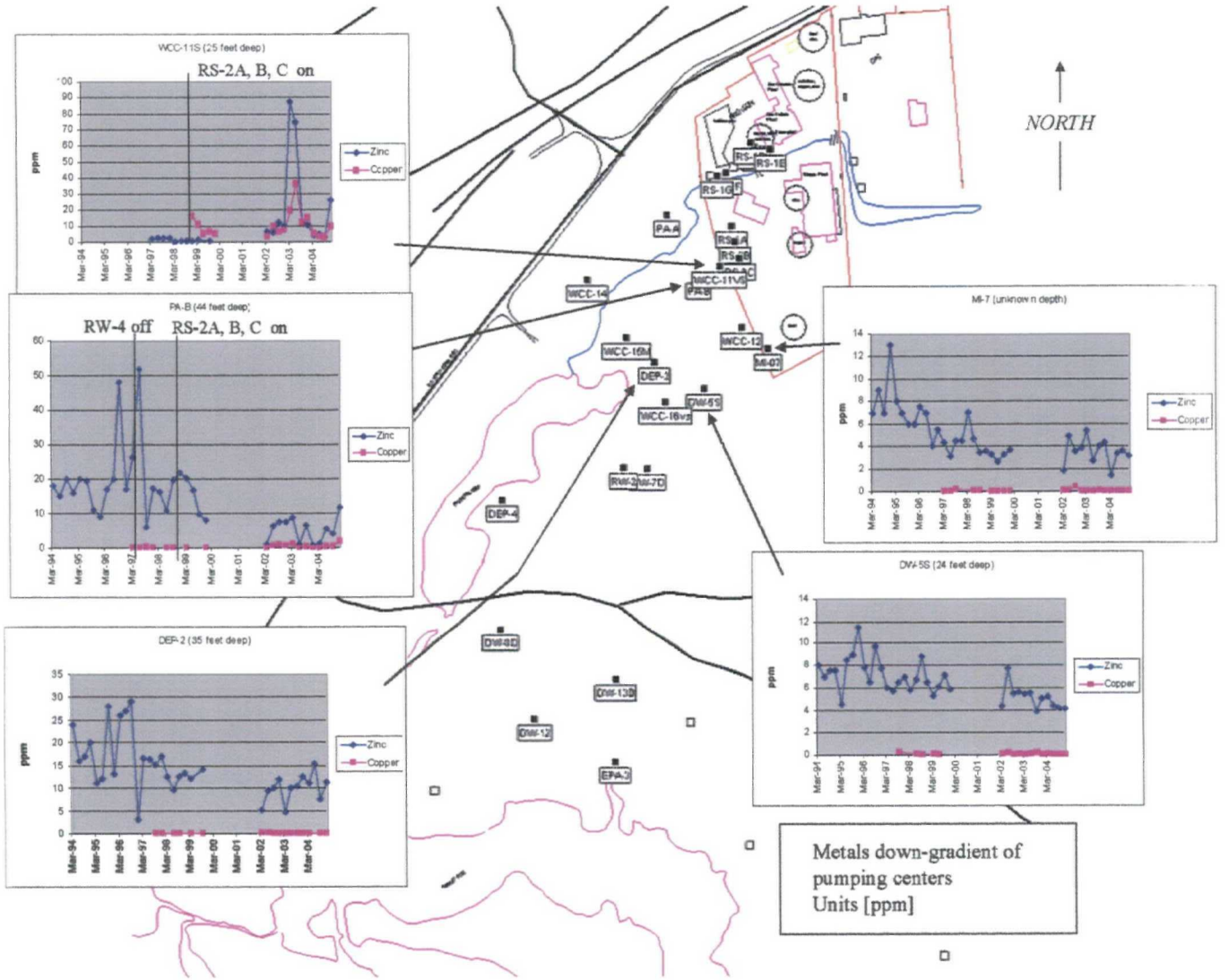


Figure 19 – The occurrence of metals downgradient of the MI site, to the south of the drainage way. While the wells just downgradient of the pumping center show attenuation resulting from capture (PA-B and WCC-11S), the off-axis wells do not (DEP-2, MI-7 and WCC-5S). Plot gaps indicate no data available.

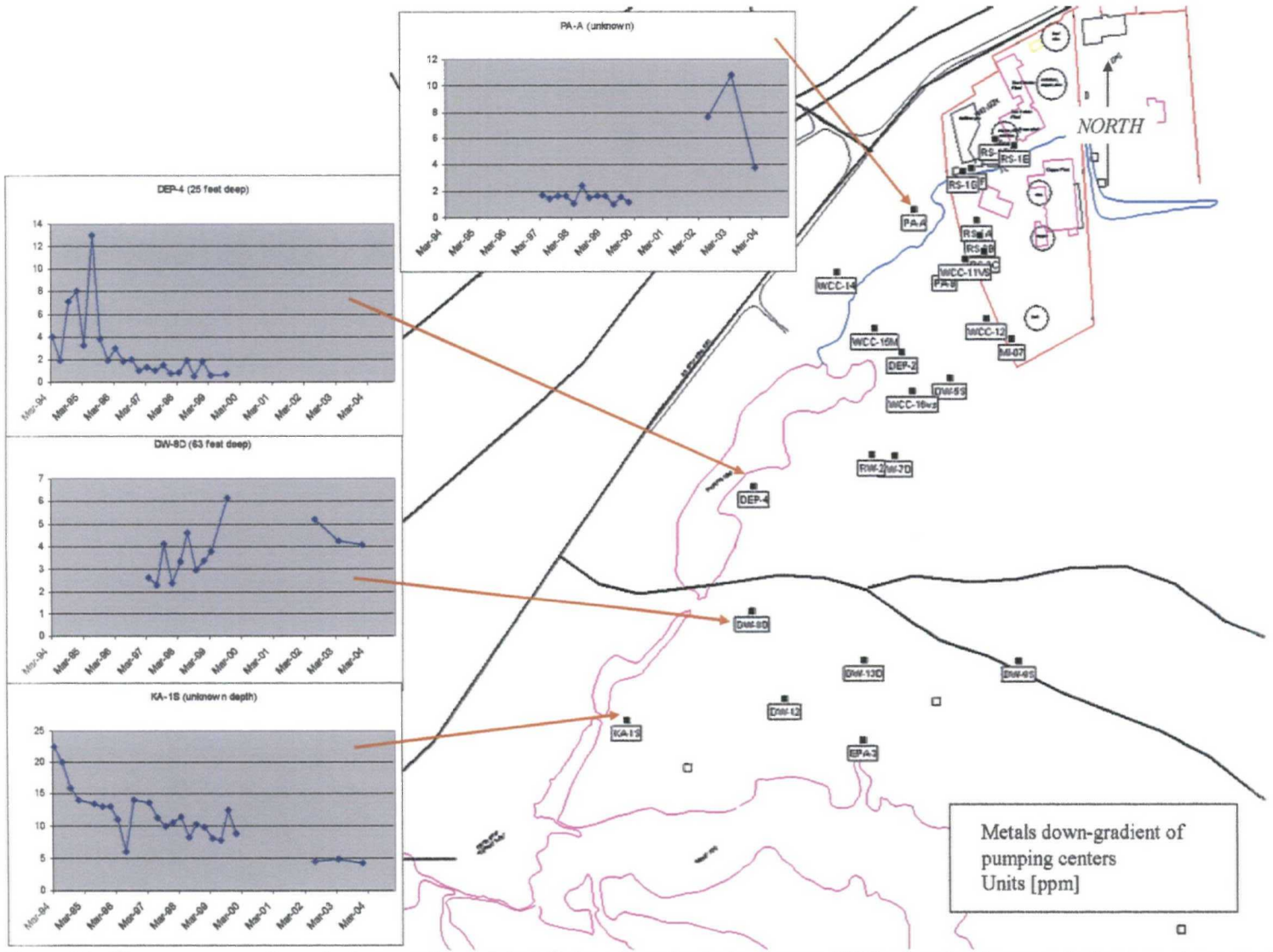


Figure 20 - The occurrence of metals downgradient of the MI site, along the drainage way. While there has been marked attenuation at the far downgradient well (KA-1S), attenuation at the other wells is less clear, mainly because data are sparse. Plot gaps indicate no data available.

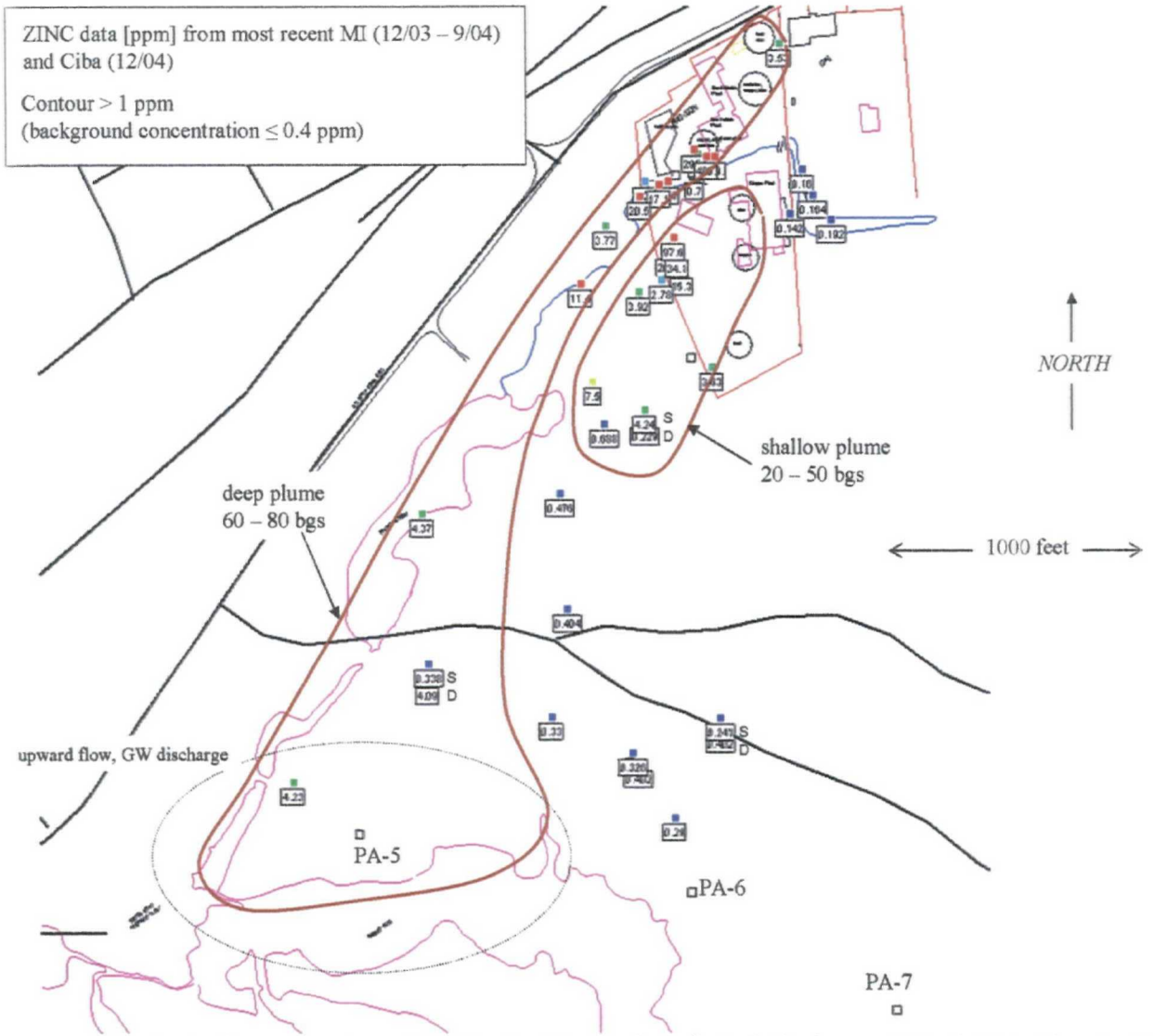


Figure 21 – Based source area, groundwater flow and water quality data, the MI zinc plume footprint is shown. Note that PA-5 is not active due to zinc contamination.

7.1.7 Effectiveness of Pump-and-Treat Systems

The CPS and MI pump-and-treat systems are extracting a substantial amount of mass as indicated by the concentrations measured over time (see Figures 12 and 18). In this regard, the P&T is providing a valuable service (mass extraction).

However, it is clear that a significant amount of VOC mass is crossing the CPS property line near CPS-1 (Figure 12). While these are similar compounds as are found in the extraction wells, based on concentration magnitude both in extracted groundwater and in the characterized source area, it is not clear whether this mass is associated with the characterized source area or is associated with an unknown source. Further investigation is required to characterize not only the capture character of the P&T system, but the source area as well.

With regard to the MI P&T, there is an insufficient amount of data to assess the capture efficiency. Clearly RS-2 wells are providing effective local capture. However, it appears that mass is getting by south of these wells. While the RS-1 wells are extracting high concentrations, there is insufficient data to support a capture characterization.

7.1.8 Conclusion

This section presented an analysis for characterizing the nature and extent of contamination associated with the CPS/Madison Site. The characterization was achieved by combining data relevant to source area characterization, hydrogeology, the time-history of aquifer stress conditions, and groundwater contaminant time trends. While the VOC plume and the metals plume characterizations were presented separately, the interpretations and assumptions used for both are self-consistent.

The VOC plume is assumed to be unique to the CPS Site. The following conclusions are drawn from the analysis (pending further investigation):

- The plume is characterized spatially by chlorobenzene.
- Distribution of CPS mass is consistent with identified source area, groundwater flow and water quality data.
- There is significant VOC mass (CB, DCB, Benzene) crossing CPS property line near CPS-1.
- MI P&T (wells RS-2) does not appear to be capturing the entire CPS plume.

- Additional characterization is warranted for source and transport of mass found near CPS-1.
- Current CPS P&T is capturing the EPLC VOC plume.
- There is no evidence of metals contamination on CPS property.

The metals plume is assumed to be unique to the MI Site. The following conclusions are drawn from the analysis (pending further investigation):

- Zinc is the primary fingerprint compound which defines plume distribution.
- The capture system is removing significant mass (zinc and copper).
- Mass may be getting by the RS-2 group wells to south.
- Offsite contamination is attenuating.
- Metals contamination does not appear to be affecting supply wells 6 and 7, and appears to affect well 5.
- No evidence of metals contamination on CPS property (up-gradient).
- MI P&T is capturing VOC mass from EPLC and CPS.

Additional data needs to be collected to fill data gaps and verify the conceptual model for contaminant source, transport and fate.

7.2 Source Area Soil Characterization

As discussed in previous sections, the CPS RI was completed in three phases (Phase I, Phase II and Phase III). A Draft Feasibility Study was submitted by Ciba in May of 2001. As a result of the RI and FS, contaminated soils were delineated in all areas of the site except for soils beneath the tank farms on the site. Plant operations prevented access to tank farm soils during the RI and FS and were therefore only sparsely characterized. However, the plant closed in 2001 and operations in the tank farm ceased thereby opening access to tank farm subsurface soils for the 2003 additional soil and source area characterization.

Ciba Specialty Chemicals Inc. submitted a Sampling and Analyses Work Plan to the New Jersey Department of Environmental Protection (NJDEP) on July 28, 2003. NJDEP approved the work plan and an initial phase of the work plan was implemented in October 2003. A second phase of fieldwork was conducted in December 2003. The purpose of these field activities was to collect additional soil samples from source areas beneath the site to provide additional characterization of soils beneath the tank farm areas. The data supplemented the previously collected RI / FS data.

A total of 28 borings were conducted at the site in 2003. 129 soil samples were collected during the two phases. The initial round of sample collection was conducted by A.C. Shultes, Inc. using split-spoon sample collection methods. The second round of sample collection was done by CT & E, Inc. using geoprobe coring techniques. The split-spoons and cores were screened with a handheld Photo Ionization Detector (PID) to locate the highest concentration along the 2-foot core. Samples were collected from the 1-foot interval that emitted the highest VOC screening results. Note that utilization of this screening technique results in the collection of samples that are biased high in relation to the full length of the spoon. All samples collected were extracted with methanol in the field and sent to Lancaster Laboratory for analysis by EPA Method SW846 – 8260. Samples were collected from depths as deep as 72 feet below land surface. Most sample collection focused on the upper 20 feet of soil beneath the site. Six of the 28 borings penetrated deeper than 20 feet.

For ease of review, please note that the figures for this section are included within the section.

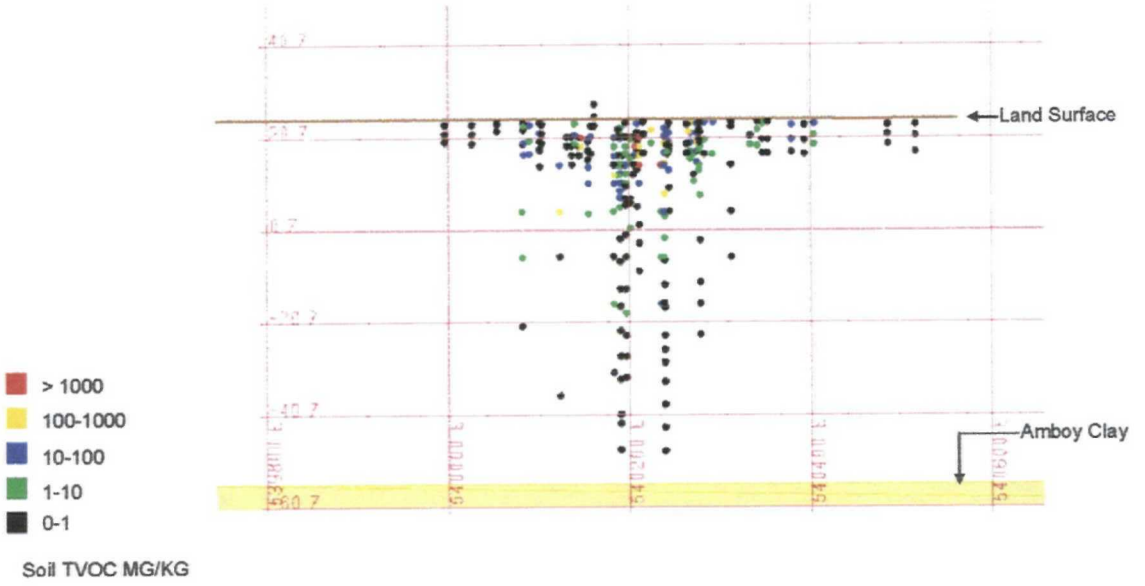
Boring locations for all source area and soil samples are depicted on Figure One in plan view. A cross section oriented with a south to north view is presented in Figure Two. The cross section shows color coded sample locations. Figure Three is a three dimensional view of the color coded sample locations oriented with a south to north view of sample locations and color coded TVOC concentrations. The water table is very shallow at the site. Depending on rainfall, the water table varies from near land surface to only a few feet below land surface. The greatest mass of contamination is located at shallow depths (within 10 to 15 feet below land surface). A summary table of all soil data is presented in Table One. An examination of the data in Table One indicates BTEX compounds, chlorobenzene and dichlorobenzenes are the most commonly detected compounds at the site.

The source area is depicted on Figure One. It contains approximately 30,000 cubic yards of material with TVOC concentrations between 10 mg/kg to 100 mg/kg. Approximately 10,000 cubic yards of material is between 100 mg/kg and 1000 mg/kg. There is about 500 cubic yards of material greater than 1000 mg/kg. Volumes were determined using a geostatistical block model.

FIGURE ONE
CPS SITE – PLAN VIEW

1.gif

FIGURE TWO
CPS SITE
Cross Section of Color-Coded TVOC Soil Samples



South to North Cross Section

2.gif

FIGURE THREE

CPS SITE

3D Grid of of Color-Coded TVOC Soil Samples

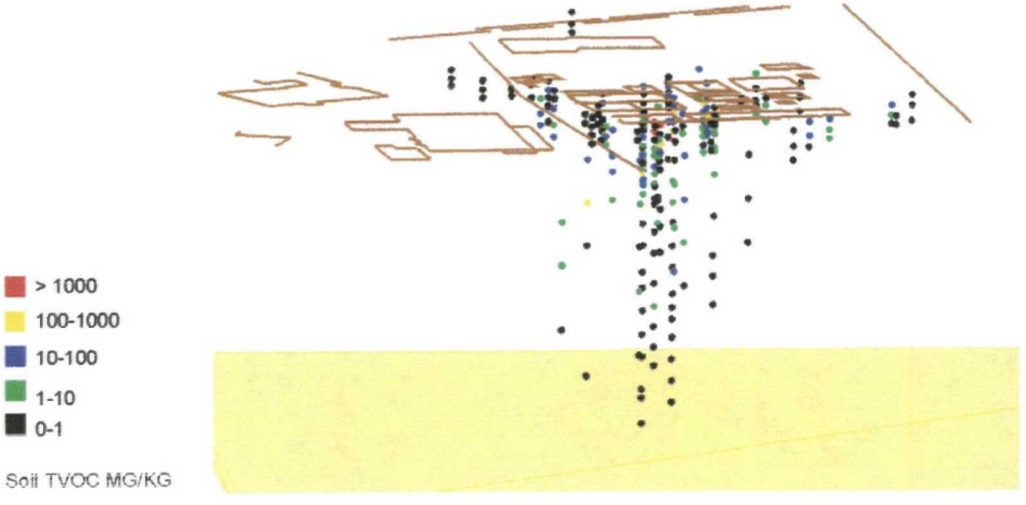


TABLE ONE
Statistical Summary Of Source Characterization Data

Chemical Name	Detected	Max Result	Mean	MCL	NJDEP
	%	mg/kg	mg/kg	mg/l	IGWSCC
					mg/kg
TOLUENE	58	2200	25.09	1	500
XYLENE (total)	46	550	8.00	1	10
ACETONE	40	45	1.93	0.7	100
CHLOROBENZENE	34	310	2.65	0.05	1
ETHYLBENZENE	30	77	1.64	0.7	100
1,2-DICHLOROBENZENE	28	2800	26.18	0.6	50
1,4-DICHLOROBENZENE	27	220	2.04	0.075	100
BENZENE	18	98	0.85	0.001	1
METHYLENE CHLORIDE	14	350	4.73	0.003	1
CIS-1,2-DICHLOROETHENE	10	150	2.49	0.07	1
1,3-DICHLOROBENZENE	10	27	0.67	0.6	100
TETRACHLOROETHENE	8	19	0.93	0.001	1
TRICHLOROETHENE	8	1200	13.45	0.001	1
1,2-DICHLOROETHANE	7	45	1.20	0.002	1
1,1,2,2-TETRACHLOROETHANE	3	17	0.05	0.001	1
TRANS-1,2-DICHLOROETHENE	3	5.8	0.10	0.1	50

ATTACHMENT #2

REMEDIATION LABORATORY QUALITY ASSURANCE MANUAL

Prepared For:

CIBA SPECIALTY CHEMICALS CORPORATION
CIBA GEIGY SUPERFUND SITE
Toms River, New Jersey

Prepared By:

CIBA SPECIALTY CHEMICALS
CORPORATE REMEDIATION
Toms River, NJ

and

ADVANCED GEOSERVICES CORP.
Chadds Ford, PA

2003

David R. Ellis
Laboratory Manager

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1.0 QUALITY ASSURANCE POLICY STATEMENT

1.1 INTRODUCTION

This document describes the CIBA SPECIALTY CHEMICALS CORPORATION Quality Assurance policies and procedures related to chemical monitoring for environmental pollutants with respect to the Corporate Remediation Laboratory in Toms River, New Jersey.

1.2 PURPOSE

Although the Laboratory is not certified by a State or Federal Regulatory Agency, the Laboratory is dedicated to providing the Corporate Remediation Services Department with analytical data and services that conform to specified requirements, identical to those of a certified laboratory. This Quality Assurance Manual details the equipment and general procedures and practices utilized to maintain this objective, and presents an overview of the essential elements of the Toms River Corporate Remediation Laboratory Quality Assurance program. The Laboratory's commitment to product of the highest quality data is reflected by our investment in the best available analytical instruments. The Laboratory is capable of testing a full array of sample materials for a wide variety of organic and inorganic chemicals.

1.3 SCOPE

The Corporate Remediation Laboratory Quality Assurance Program is designed to control and monitor the quality of data generated in the Laboratory. The program has four key elements.

- Demonstrating Laboratory capability by providing information which documents the overall qualifications of the Laboratory to perform environmental analyses;
- Generate data is scientifically sound, meets project objectives, and is appropriate for its intended use.
- Controlling Laboratory operations by establishing procedures which measure the Laboratory's performance on a daily basis;

- Measuring matrix effects to determine the effect of a specific matrix on method performance; and

- Reporting appropriate QC information with the analytical results to enable the data user to assess the quality of the data.

The specific procedures involved in implementing each aspect of the Toms River Corporate Remediation Laboratory program are described in this document.

The QA policies and QC procedures described herein are designed to eliminate systematic errors and minimize the occurrence of other errors. However, no QA program, regardless of how elaborate, can eliminate all errors which may occur during an analysis. The QA program forms the framework for minimizing errors and identifying and correcting those errors which do occasionally occur. These QA policies and QC procedures must be coupled with the professional judgment of the technical staff interpreting the events surrounding the generation of the final result to ensure that quality data is consistently produced.

This QAM undergoes annual review by the Laboratory Manager. Revisions to the QAM are distributed throughout the laboratory to replace the outdated copies so that only the most current revision is in use. It is the responsibility of the Laboratory Manager to ensure that all Laboratory employees familiarize themselves with, and comply with, the procedures laid out in this manual and associated documentation. Every fifth year, a new QAM is written as required per USEPA "EPA Requirements for Quality Management Plans" (QA/R-2, March 2001).

The policies and practices of quality assurance/quality control presented in the following text are set forth as minimums.

2.0 ORGANIZATION

2.1 ORGANIZATION AND MANAGEMENT

Although the Toms River Corporate Remediation Laboratory has a small staff, a high degree of quality assurance is maintained due to the ability and experience of each staff member. An organizational chart, resumes of key staff and experience and educational profiles for the entire laboratory are presented in **Attachment A.**

Executing an effective QA program in a laboratory system demands the commitment and attention of both management and staff. The QA effort at the Toms River Corporate Remediation Laboratory is directed by its Laboratory Manager. The Laboratory Manager reports directly to the Technical Director of Ciba Remediation Services and has the responsibility for overseeing and regulating all Laboratory functions.

The implementation of the QA program in the Laboratory is the responsibility of the Laboratory Manager. In addition, all scientists within the organization play a vital role in assuring the quality of their work. The success of the Toms River Corporate Remediation Laboratory is dependent upon the continued commitment of all members of the organization to a strong and viable QA Program. The responsibilities and levels of authority within the organization are structured to provide a strong QA Program. The responsibilities and levels of authority within the organization are described below.

CURRENT PERSONNEL FOR KEY POSITIONS

The Toms River Corporate Remediation Laboratory Quality Assurance Officer is:

Dr. David R. Ellis, Ph.D.
Laboratory Manager
Voice: (732) 914-2510
Fax: (732) 914-2909

Key Toms River Corporate Remediation Laboratory personnel directly responsible for overall sampling and analytical project coordination include:

Ms. Dorren K. McNichols, B.S.
Remediation Chemist, QA / QC
Voice: (732) 914-2512
Fax: (732) 914-2909

Key personnel directly responsible for analyses of the samples include:

Ms. Janet M Hlavac, B.S.
Remediation Chemist & Sample Custodian
Voice: (732) 914-2512
Fax: (732) 914-2909

Mr. Bill Mores
Air Monitoring Supervisor
Voice: (732) 914-2824
Fax: (732) 914-2909

All of the above personnel are located at:

Ciba Specialty Chemicals Corporation
Oak Ridge Parkway
PO Box 71
Toms River, NJ 08754

3.0 ROLES AND RESPONSIBILITIES

3.1 LABORATORY MANAGER

The QA effort within the Toms River Corporate Remediation Laboratory is directed by the Laboratory Manager who reports to the Technical Director of Ciba Remediation Services.

The Laboratory Manager is responsible for:

- Developing and implementing a QA program that ensures that all data generated in the Toms River Corporate Remediation Laboratory is scientifically sound, legally defensible, and of known precision and accuracy;
- Monitoring the QA Plan to ensure compliance with QA objectives in the Remediation Laboratory;
- Developing and implementing new QA procedures within the system to improve data quality;
- Conducting audits and inspections of the Toms River Corporate Remediation Laboratory on a regular basis, and applying corrective actions as needed to ensure compliance with the Toms River Corporate Remediation Laboratory QA Plan;
- Establishing databases that accurately reflect the performance of the Remediation Laboratory;
- Communicating QA issues with both clients and Laboratory staff;
- Promoting sound QA practices within the environmental regulatory and analytical communities;
- Actively supporting the implementation of the Toms River Corporate Remediation Laboratory Quality Assurance Plan within the Laboratory;

- Maintaining accurate SOPs and enforcing their use in the Laboratory; and
- Maintaining a work environment that emphasizes the importance of data quality.

The Manager of the laboratory has the authority to accept or reject data based on compliance with well-defined QC criteria. The Manager is the final authority on all issues dealing with data quality and has the authority to require that procedures be amended or discontinued, or analyses suspended or repeated. In addition, the manager can accept or reject data that falls outside of established QC guidelines if, in his judgment, there are technical reasons which warrant the acceptance or rejection of the data. These circumstances must be well documented, and any need for corrective action identified by the incident must be defined and initiated. The Laboratory Manager who directs the analytical work at the Toms River Corporate Remediation Laboratory is directly responsible for ensuring that all employees reporting to him are complying with the Corporate Remediation Laboratory Quality Assurance Plan. Also the Manager has the authority to recommend suspension or termination of employees on the grounds of dishonesty, incompetence or repeated non-compliance with QA procedures. The authority of the Laboratory Manager comes directly from the Technical Director of Ciba Remediation Services.

3.2 CHEMISTS AND TECHNICIANS

All Laboratory personnel involved in the generation and reporting of data have a responsibility to understand and follow specific analytical methodologies detailed in Standard Operating Procedures (SOPs) and the Toms River Corporate Remediation Laboratory Quality Assurance Plan.

Laboratory personnel are responsible for:

- Having a working knowledge of the Toms River Corporate Remediation Laboratory Quality Assurance Plan;
- Ensuring that all work is generated in compliance with the Toms River Corporate Remediation Laboratory Quality Assurance Plan;

- Performing all work according to written SOPs;
- Ensuring that all documentation related to their work is complete and accurate; and
- Providing management with immediate notification of quality problems.

Laboratory personnel have the authority to accept or reject data based on compliance with well-defined QC criteria. The acceptance or rejection of data that fall outside of established QC guidelines must be approved by Laboratory management. The authority of the Laboratory personnel flows from the Laboratory Manager.

The Sample Custodian is responsible for the receipt and handling of samples within the laboratory. Responsibilities include:

- Implementation of proper sample receipt procedures and sample preservation;
- Implements, completes and/or reviews external and internal chain-of-custody, as appropriate;
- Communicates and records anomalies associated with the condition of samples upon receipt of samples to the Laboratory Manager;
- Assigns a laboratory identification number to a sample and logs the sample into the Laboratory Information Management System (LIMS);
- Secures sample storage and preservation;
- Assists Health and Safety Officer with sample disposal; and
- Reviews storage monitoring records.

Reporting and Document Control is performed by all employees of the Laboratory. All employees are responsible for compiling analytical reports and achieving data results.

DORREN K. McNICHOLS
1417 Broadway Boulevard
Toms River, New Jersey 08757
(732) 244-8335

PROFESSIONAL EXPERIENCE

Ciba Specialty Chemicals Corporation, Toms River, New Jersey 1997-Present

Supervisor/Chemist GC/MS Laboratory

- Responsible for the analysis of routine and non-routine environmental samples using EPA, NJDEP, SW-846 and CLP protocols for GC/MS.
- Extract both volatile and semi-volatile soil samples prior to chromatographic analysis.
- Maintain, calibrate and solve problems with laboratory instrumentation.
- Develop GC methods for field air analysis using the Photovac Voyager Portable GC.
- Analyze air samples following TO-14, TO-15 and TO-17 protocols.
- Work with air sampling equipment for cleaning and preparing summa canisters.
- Introduce other techniques including Wet Chemistry into the laboratory.

CIBA-GEIGY Corporation, Toms River, New Jersey

Laboratory Supervisor / Senior Chemist

- Supervised laboratory analysts using chromatographic separation techniques (IC,GC), inorganic techniques (FAA, ICP, Zeeman GFAA, CVHG) and classical wet chemistry methods. 1991 - 1996
- Responsible for training and cross training of personnel, scheduling of sample analysis, SOP development, troubleshooting instruments and reviewing data packages.
- Co-authored Quality Assurance Manual incorporating traceability of standards and GLP requirements.
- Responsible for maintenance of laboratory certification and technical review of analytical data.
- Assured safe working conditions in the laboratory through training and inspections.
- Departmental Hazardous Waste Coordinator.
- Purchased new laboratory instrumentation, which increased sample output by 45% and allowed the laboratory to accept additional work without increasing manpower.
- Responsible for sample preparation prior to chromatographic analysis.
- Introduced new sample preparation techniques into the laboratory resulting in the transfer of analysis from the slower GFAA to the ICP and transferred classical wet chemistry techniques to chromatography separation techniques.

Chemist B

- Analyzed environmental samples, using EPA, NJDEP, SW-846 and CLP protocols for IC, ICP, TOC, Zeeman GFAA, Flame AA and cold vapor mercury. 1989 - 1991
- Assured conformance to NJDEP requirements.
- Assisted in achieving laboratory certification.
- Maintained, calibrated, and solved problems with laboratory instrumentation.

Analytical Chemist

- Supervised and developed analytical methods for wet chemistry, LC, GC and IC laboratories. 1984 - 1989
- Implemented Raw Material Testing Program, including interaction with Purchasing personnel for establishment of acceptable raw material specifications.
- Provided instructions and recommendations to plant personnel on proper equipment and sampling techniques resulting in a decrease in resamples.
- Created a database utilizing LOTUS 1-2-3 software for recording raw material analytical results and developed analytical methodology for testing.

Technical Assistant 1983 - 1984

- Supervised 10 Laboratory Technicians who performed quality control testing on vat dyes and dye standardization.
- Introduced new dye from plant development to production.
- Assisted plant personnel in troubleshooting production problems.
- Operated Applied Color System Spectrophotometer and assisted in debugging existing software.

Laboratory Technician 1978 - 1983

- Performed qualitative and quantitative analysis of intermediates and finished products using a multitude of laboratory techniques including TLC, LC, GC and wet chemistry.
- Responsible for providing data on blending of ingredients for foremen and chemical operators.

LABORATORY SKILLS

- ICP (Fisons & Leeman)
- Flame AA (Perkin-Elmer)
- GFAA (Perkin-Elmer & Hitachi)
- CVHG (Milton Roy)
- Colorimeter (Hach & Technicon)
- Sample Concetrators (Tekmar)
- IC (Dionex)
- TOC (Shimadzu)
- GC/MS (Hewlett Packard)
- LC (Waters & Dionex)
- Titrators (Brinkmann & Mettler)
- EPA / NJDEP / CLP Protocols

COMPUTER SKILLS

- LIMS (Beckman & Perkin-Elmer)
- MS ChemStation
- WordPerfect 5.2
- Evolution
- Microsoft Office 2000
- Lotus 1-2-3 for Windows
- Plasma Vision
- GEM

EDUCATION

B. S., Chemistry, College of Mount Saint Vincent, Bronx, NY

TRAINING

- Perkin-Elmer Furnace & Flame AA (1990)
- Management Skills for Women Supervisors (1991)
- Supervisory Skills and Labor Relations (1992)
- Fundamentals of HPLC (1997)
- GC/MS Applications & Troubleshooting (1998)
- Quality Improvement Through Defect Prevention (1990)
- Hitachi Zeeman GFAA (1991)
- Fisons ICP (1994)
- Dionex IC (1993)
- Dionex ASE (1997)
- Perkin Elmer ATD 400 (2000)

Janet M. Hlavac
1341 Silverton Road
Toms River, NJ 08755
(732) 286-2028

Analytical Chemist with seven years experience in certified testing lab. Knowledgeable of sample preparation prior to analysis and familiar with EPA and NJDEP protocols required for sample analysis, as well as CLP. Interpret data and report results passing protocol requirements. Create concise reports using Microsoft Excel / Word. Attentive to customer needs and efficient in meeting deadlines. Team oriented and organized with communication and computer skills.

Professional Experience

Ciba Specialty Chemicals Corporation, Toms River, NJ — 1998 - Present

Analytical Chemist

- Developed LC Method to determine the degradation of surrogates by naturally occurring bacteria in soils under both aerobic and anaerobic conditions.
- Extracted samples for analysis from soils using Dionex Accelerated Solvent Extractor.
- Analyzed groundwater samples for chlorides, bromides and sulfates, and soil samples for chlorides, nitrates, phosphates and sulfates using Ion Chromatography.
- Analyzed groundwater samples for metals using Hach Spectrophotometer.
- Set-up and maintained air sampling pumps equipped with carbon tubes and pumps with filters to collect particulates at five excavation sites for Biopilot Study.
- Monitored mixed soil piles in Building 110 for biodegradation using air pumps equipped with tedlar bags.
- Analyzed wetlands samples for Carbon, TKN, Ca, K, Mg, Na, P, pH, % solids etc. using various wet chemistry methods.
- Used Perkin-Elmer "Voyager" Portable GC at various sites to determine baseline TVOC values before the excavation and TVOC values during and after the excavation.
- Maintain and calibrate analyzers monitoring the treated groundwater in the Wastewater Treatment Plant.
- Decon jars for compliance sampling, prepare paperwork and samples for Lancaster Labs.

Carter-Wallace, Inc., Cranbury, NJ — 1997 -1998

Laboratory Technician II

- Responsible for quality control analysis of ethical pharmaceuticals from production to approval, as well as stability testing prior to and after expiration date, using USP / NF methods.
- Insrumentation includes Distek Dissolution Equipment, Nicolet IR, Zymark Robotics, HP Gas Chromatography (Model 5890), and Waters Liquid Chromatography with both UV and RI detectors.

Ciba-Geigy Corporation, Toms River, NJ

Analytical Chemist — 1992 -1996

- Responsible for analysis of samples using EPA, NJDEP, SW-846 and CLP protocols for IC, ICP, Zeeman Graphite Furnace, Flame AA and Cold Vapor Mercury.
- Actively trained and cross-trained personnel in laboratory techniques and instrumentation.
- Maintained instrumentation and solved problems by troubleshooting to avoid downtime.
- Exported raw data to an Excel spreadsheet to create a concise and orderly results report.

Associate Chemist 1989 - 1992

- Analyzed ground and drinking water samples, as well as solid samples, for a wide spectrum of inorgani parameters according to EPA and NJDEP protocols, utilizing IC, ICP, and Cold Vapor Mercury.
- Interpreted and reported analytical data meeting QC acceptance parameters.
- Assisted in achievement and maintenance of laboratory certification.
- Sampled both on and off site monitoring wells in accordance with EPA and NJDEP protocols.
- Co-authored the Toms River site "Groundwater Sampling and Analysis Plan".

Technical Assistant 1986 - 1989

- Worked in the New Technology Plant Support Group providing analytical support to process development utilizing HPLC instrumentation
- Co-authored SOP's for the analysis of dyestuffs during the production process.

Shift Technician / Technical Assistant 1982 - 1986

- Worked in Azo Control Lab. analyzing on-line samples of azo dyes throughout the production process.
- Supervised ten azo control laboratory technicians, providing work schedules and analytical instructions.
- Responsible for maintaining instrumentation and ordering supplies to keep laboratory running efficiently.

Positions Prior to 1982

Merck And Co., Inc., Rahway, NJ

Staff Microbiologist, Department of Parasitology

- Involved in life cycle studies of the coccidia, *Eimeria tenella*, using chick embryo kidney cells in tissue culture.
- Responsibilities included aseptic removal of kidneys from chick embryos and subsequent cell preparation for growth in tissue culture.
- Techniques included trypsinization, counting, inoculation into growth media, plating, feeding and maintenance in a CO2 incubator.
- Successfully produced film on the life cycle of *Eimeria Tenella* utilizing time-lapse microcinematography.

Microbiologist, Department of Microbiology

- Used the embryonated chick egg as an assay tool in studies with PPLO and Avian Leucosis.
- Developed successful, reliable *in ova* test where infection and test drug were inoculated into the yolk sac.
- Required skills such as candling, membrane dropping, window drilling in shell, implantation of infected tissue on the membrane and inoculation of chemotherapeutic agents into the embryonic sac / membrane arteries.

Junior Microbiologist, Department of Microbiology

- Involved in research on new antibiotics.
- Achieved proficiency in media preparation, sterilization, aseptic technique, serial dilution, solubility, inoculation, plating and pH observation.
- Performed shake flask fermentation studies with regard to growth medium, temperature and pH for optimum antibiotic production.

Experimented with embryonated chick eggs and the absorption of antibiotics through the shell.

Janet M. Hlavac

Education

B. S., Biology, Chestnut Hill College, Philadelphia, PA

Training

Fisons ICP : Theory, Software, Maintenance and Troubleshooting, 1993
Dionex IC: Maintenance and Troubleshootong, 1990
HPLC: Fundamentals of HPLC, 1997

Awards

Environmental Employee of the Quarter for teamwork in the development of the Toms River Monitoring Sampling and Field Measurement Protocol, 1989.

Toms River Site Employee of the Second Quarter for saving 100% of glass test tube washing time per wee by using plastic tubes as liners in the glass test tubes of the ICP autosampler, 1993.

4.0 TRAINING

It is the policy of the Laboratory to employ permanent staff who are appropriately qualified and/or trained to perform their respective duties. Where, for project reasons, it is necessary to employ temporary staff, the laboratory ensures that the same criteria as those governing permanent staff apply with respect to training and qualifications.

Personnel training procedures begin with an orientation program designed to familiarize the new associate with safety and chemical hygiene issues, the importance of quality assurance/quality control in the analytical laboratory, and company policies and benefits.

The level of training necessary to perform analytical tasks is determined from employee's academic background and past experience, technical courses, and on-the-job training with specific methods or instrumentation. The responsibility of formal academic training lies foremost with the individual. The responsibility for the additional specialized skills obtained through in-house training or external workshops is a shared obligation of the individual, his/her supervisor, and the laboratory. An individual's academic and professional experience is kept on file including an initial statement of qualifications or resume and any additional documentation concerning subsequent training.

In order to ensure that the policies and objectives of this QAM are communicated to all new personnel, all associates are required to read this QAM during the training process. This training is documented on the *Record of Individual Training* (**Attachment E**) and included in the training files of each associate.

Trainees are under the supervision of experienced analysts who are responsible for showing them the analytical procedures including applicable QA/QC measures. A new analyst is not permitted to perform an analysis until his/her supervisor is confident that the analytical and QA/QC procedures can be carried out correctly and method proficiency is documented.

Technical training is accomplished within the laboratory to ensure method (SOP) comprehension. All new personnel are required to demonstrate competency in performing a particular method by successfully completing a Demonstration of Capability (DOC) before conducting analysis independently.

DOCs are performed by analysis of four replicate QC samples. Results of successive LCS analyses can be used to fulfill the DOC requirement. The accuracy and precision, measured as average recovery and standard deviation (using n-1 as the population), of the 4 replicate results are calculated and compared to those in the test method (where available). If the test method does not include accuracy and precision requirements, the results are compared to target criteria set by the laboratory. The laboratory sets the target criteria such that they reflect the DQOs of the specific method or project. A DOC Certification Statement is recorded and maintained in the employee's training or personnel file. An example of a DOC Certification Statement can be found in **Attachment E.**

The Toms River Corporate Remediation Laboratory is equipped with many structural safety features. Each associate is familiar with the location, use, and capabilities of general and specialized safety features associated with their workplace. To protect associates from potential workplace hazards, the Toms River Corporate Remediation Laboratory provides and requires the use of certain items of protective equipment. These include safety glasses, protective clothing, gloves, respirators, etc. For a complete description of the types of personal safety equipment available and applicable to a particular workspace, refer to the laboratory Chemical Hygiene Plan manual.

4.1 ON-GOING TRAINING

The Toms River Corporate Remediation Laboratory has a firm commitment to make sure that all analysts remain proficient in the tests that they perform. SOPs are reviewed annually and analysts are required to read the latest version of the SOP. Performance evaluations are analyzed by the laboratory.

4.2 ETHICS POLICY

Establishing and maintaining a high ethical standard is an important element of a Quality System. In order to ensure that all personnel understand the importance the Corporation places on maintaining high ethical standards at all times, the Ciba Specialty Chemicals Corporation requires that each employee understands the Corporate "Code of Conduct" policy and receives formal training.

5.0 LABORATORY FACILITY AND EQUIPMENT

The Toms River Corporate Remediation Laboratory is active in environmental analysis and offers a full range of analytical services to the Corporate Remediation Services Department. The laboratory is compliant with current Occupational Safety and Health Administration (OSHA) regulations and is equipped with environmental controls including air conditioning and building security systems. In addition, the laboratory is outfitted with instrumentation exhibiting advanced technology and automation.

The laboratory facility has high purity water system.

5.1 SECURITY

Because of the nature of the Toms River Corporate Remediation Laboratory's work, adequate security of the facilities, equipment and project files is necessary. Visitors register upon entering the Site and are accompanied by an associate while visiting. The Laboratory Manager ensures that personnel are familiar with the Toms River Corporate Remediation Laboratory's security policies.

The laboratory facilities are secured with an alarm system.

5.2 EQUIPMENT INVENTORY

A comprehensive list of major instrumentation available, along with supporting and miscellaneous equipment can also be found in **Attachment C.**

6.0 PREVENTIVE MAINTENANCE

To minimize system down time and corrective maintenance costs, and to ensure data validity, the Remediation Laboratory utilizes a system of preventive maintenance. General preventive maintenance procedures, many of which are unique to particular instruments, are outlined in each instrument's operation manual. All routine maintenance is performed as recommended by the manufacturer. The manuals also assist in the identification of commonly needed replacement parts, so that an inventory of these parts can be maintained at the laboratory. It is the Chemists/Technicians' responsibility to make sure that the most current version of the operator manual is available in the laboratory. Routine maintenance is performed by the analyst while external technicians may be called in for major repairs.

A bound maintenance and repair log notebook is kept with each instrument to record all routine and non-routine maintenance. Notation of the date and maintenance activity is recorded every time service procedures are performed. This includes routine service checks by laboratory personnel as well as factory service calls. The return to analytical control following instrument repair is also noted in laboratory maintenance logbooks.

7.0 COMPUTER HARDWARE AND SOFTWARE

Whenever possible, the laboratory establishes standards for computer systems and peripheral equipment. In instances where a vendor-provided solution is bundled with hardware and software, the vendor certifies that the proposed hardware readily operates with existing hardware platforms, and will provide operating and maintenance instructions. Computer system hardware is configured by Toms River Corporate Remediation Laboratory associates or vendor technicians. Major hardware items include systems used for data collection and dedicated and networked printers. Major software includes HP MS Chemstation.

8.0 LABORATORY SCOPE OF TESTS

The laboratory can be requested to perform a wide variety of inorganic and organic analyses on various matrices including air, water, soil, and sludge. Analyses follow acceptable regulatory protocols. Detailed descriptions of accepted procedures and reporting limits are maintained in the individual method SOPs. **Attachment D** of this QAM presents a summary of the methods employed by the Toms River Corporate Remediation Laboratory.

9.0 REFERENCE TO TEST PROCEDURES USED

The following list includes the sources for the majority of analytical methods referenced by the laboratory:

Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, USEPA, January 1996.

Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act, 40 CFR Part 136, USEPA Office of Water.

Methods for Chemical Analysis of Water and Wastes, EPA 600 (4-79-040), 1983.

Methods for the Determination of Organic Compounds in Drinking Water, EPA-600/4-88-039, December 1988, Revised July 1991, Supplement I, EPA-600-4-90-020, July 1990, Supplement II, EPA-600/R-92-129, August 1992.

Methods for the Determination of Inorganic Substances in Environmental Samples, EPA 600 (R-93-100), August 1993.

Statement of Work for Inorganic Analysis, ILM04.0, USEPA Contract Laboratory Program, Multi-media, Multi-concentration.

Statement of Work for Organics Analysis, OLM03.2, OLM04.2, USEPA Contract Laboratory Program, Multi-media, Multi-concentration.

Standard Method for the Examination of Water and Wastewater, 19th Edition; Easton, A.D. Clesceri, L.S. Greenberg, AE. Eds; American Water Works Association, Water Pollution Control Federation, American Public Health Association: Washington, D.C., 1995.

Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986; Final Update I, July 1992; Final Update IIA, August 1993; Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996.

Annual Book of ASTM Standards, American Society for Testing & Materials (ASTM), Philadelphia, PA.

USEPA Low Concentration Organic Analysis. USEPA, OLC2.1.

Procedures for Handling and Chemical Analysis of Sediment and Water Samples, Plumb, Russell, USEPA Corps of Engineers, May 1991.

10.0 ARRANGEMENTS ENSURING LABORATORY REVIEW OF NEW WORK

The Laboratory Manager considers available resources before accepting new work. The same consideration must be evaluated prior to the laboratory expanding its scope of testing. Feasibility of method development and method proficiency demonstration must be established. If the Laboratory determines it has the ability and desire to perform the work, a plan for implementation is prepared. This would include but not be limited to: acquiring necessary equipment, reagents and/or standards, training analysts, writing appropriate SOPs, and performing MDL and P&A studies.

11.0 CONFIDENTIALITY

It is the Remediation Laboratory's policy not to release any information pertaining to projects and reports, except to the person who submitted the samples.

12.0 PROCEDURE FOR ADDRESSING COMPLAINTS

This procedure provides guidance for investigation of technical complaints. That is, a complaint concerning the validity of the laboratories' test result or test methods or the interpretation of a technical specification. Complaints may originate verbally or in written form. All complaints are documented and investigated by the Laboratory Manager. The Laboratory Manager is responsible for working together with the Chemist/Technician to investigate and resolve the complaint, dependent on the complexity and severity of the complaint. In cases where the complaint relates to data quality or the quality system, the QA Manager may conduct an internal audit. Depending on the type of complaint, the time frame is decided. Generally, if the complaint is related to the specific project data, it is resolved immediately and the revised data is submitted.

13.0 SUBCONTRACTED ANALYSES

There are occasions when particular laboratory analyses cannot be completed in-house by the Toms River Corporate Remediation Laboratory. This may occur because the laboratory does not have the necessary instrumentation, equipment or certification to perform the analyses. The laboratory also subcontracts overflow work as necessary when instrument problems occur or physical capacity is exceeded. Prospective subcontracting firms are thoroughly reviewed with an emphasis on their quality control program and associated certifications. The Laboratory Manager will ensure that the laboratory receiving the subcontracted work maintains the necessary certifications and level of quality to perform the work to project specifications. When samples are sent, they are shipped to the subcontracting firm from the laboratory, and the results of the analyses are transmitted back to the laboratory for review.

14.0 PROCEDURES FOR TRACEABILITY OF MEASUREMENTS

An external certified service engineer services balances on an annual basis. This service is documented on each balance with a signed and dated calibration stamp. Balance calibrations are verified on a monthly basis using Class S weights. Analytical balances are checked at multiple weights and the measured weight is recorded in a bound monitoring logbook. Any discrepancies are brought to the immediate attention of the Laboratory Manager.

All mercury thermometers and temperature probes are calibrated annually against traceable reference thermometers. On a daily basis the temperature readings of the ovens, refrigerators, and other temperature-controlled equipment are recorded on log sheets. Any corrective action that is required is performed by the Chemist.

The conductivity of the laboratory-deionized water is checked daily with an in-line meter. The accuracy of the meter is checked monthly with a conductivity probe in accordance with EPA method 120.1. This information is recorded on log sheets, which are maintained by a laboratory Chemist.

Traceability of measurements is assured through the use of a system of documentation and analysis of testing materials. All standards used in the calibration of instrumentation are certified by the supplier as to their accuracy. These certificates of analysis are maintained by the laboratory. The preparation of all standards is recorded in department Standard Preparation Logbooks. Information to facilitate traceability is included in this documentation. All standard and reagent labels must contain the following information: solution ID, concentration, date of preparation, initials of preparer, expiration date.

15.0 DATA QUALITY OBJECTIVES

The effectiveness of a QA program is measured by the quality of data generated by the laboratory. Data quality is judged in terms of its precision, accuracy, representativeness, completeness and comparability. These terms are described as follows:

Precision is the degree to which the measurement is reproducible. Precision can be assessed by measurements of duplicate preparations of a sample or matrix spike/matrix spike duplicate set (MS/MSD). Precision is determined by comparison of these duplicates. The difference between two analytical measurements of the "same" sample prepared in duplicate leads to some indication of the precision or reproducibility of the analysis mechanism. It is the analysis scheme that should be the greatest cause of departure from obtaining identical values. Statistical evaluation of a series of differences allows an assignment of precision to the analysis for a given sample matrix. One indicator of precision is relative percent difference (RPD). The Toms River Corporate Remediation Laboratory determines control status of an analysis with regard to precision by employing the statistical analysis of historical duplicate data for a given analysis to generate control limits for the evaluation of future data generated by that analysis. Typically, a control limit for a specific analysis is RPD equal zero (identical duplicate results) to three standard deviations of an array of twenty recent RPD values. This may be tracked in a tabular or graphic manner.

Accuracy is a determination of how close the measurement is to the true value. Accuracy can be assessed using standard reference materials or spiked environmental samples. The determination of the accuracy of a measurement requires a knowledge of the true or calculated value for the control sample or of the amount of analyte being added to the sample. Accuracy may be calculated in terms of percent recovery, which is the amount of analyte exhibited in the routine analysis of the control sample minus any analyte originally present, divided by the amount added, expressed as a percent. The Toms River Corporate Remediation Laboratory determines control status of an analysis with regard to accuracy by employing the statistical analysis of historical recovery data for a given analysis to generate control limits for the evaluation of future

data generated by that analysis. Typically, a control limit for a specific analysis is plus/minus three standard deviation units about the average recovery of an array of twenty recent recovery pairs. This may be tracked in a tabular or graphic manner.

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Analytical data should represent the sample analyzed regardless of the heterogeneity of the original sample matrix. The Toms River Corporate Remediation Laboratory strives to accommodate all sample matrices. Some samples may require analysis of multiple phases to obtain representative results. It is the responsibility of those performing the sampling to assure that the sample collected is representative of field conditions.

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions. To be considered complete, the data set must conform to all quality control criteria which verify precision and accuracy for the analytical protocol. Immediate corrective action will be taken when it is known that resampling will be required or if repreparation or reanalysis of a sample will be required. Attempts will be made to perform the reanalysis within holding time so that the data may be considered complete.

Comparability expresses the confidence with which one data set can be compared to another data set measuring the same property. Comparability is ensured through the use of established and approved analytical methods, consistency in the basis of analysis (wet weight, volume, etc.), consistency in reporting units (ppm, ppb, etc.) and analysis of standard reference materials.

Traceability is the extent to which reported analytical results can be substantiated by supporting documentation. Traceability documentation exists in two essential forms: those which link the quantitation process to authoritative standards, and those which explicitly describe the history of each sample from collection to analysis and disposal. The traceability goal for the laboratory is 100%.

16.0 QUALITY CONTROL MEASURES

Laboratory QC evaluation is provided as an integral part of every analysis. The main elements of analytical quality assurance at the Toms River Corporate Remediation Laboratory include but are not limited to the following:

- The generation of a multi-point calibration curve or the analysis of a daily or more frequently analyzed mid-range standard that verifies the initial multi-point curve;
- The analysis of blanks;
- The analysis of matrix spike and matrix spike duplicates at a prescribed frequency;
- The analysis of laboratory control samples at prescribed frequencies;
- The analysis of surrogate compounds (organic analyses); and
- The analysis of proficiency samples.

The aforementioned elements are discussed below. Please refer to Section 21 of this QA Plan for a discussion of calibration procedures.

16.1 METHOD BLANK

Method blanks, also known as reagent, analytical or preparation blanks, are analyzed to assess the level of background interference or contamination which exists in the analytical system and which might lead to the reporting of elevated concentration levels or false positive data.

As part of the standard Toms River Corporate Remediation Laboratory program, a method blank is analyzed with every batch of samples processed. A method blank consists of reagents specific to the method which are carried through every aspect of the procedure, including preparation, cleanup and analysis. The results of the method blank analysis are evaluated, in conjunction

with other QC information, to determine the acceptability of the data generated for that batch of samples.

Ideally, the concentration of target analytes in the blank should be below the Reporting Limit for that analyte. In practice, however, some common laboratory solvents and metals are difficult to eliminate to the parts-per-billion levels commonly reported in environmental analyses. Therefore, criteria for determining blank acceptability must be based on consideration of the analytical techniques used, analytes reported and Reporting Limits employed.

For organic analyses, the concentration of target analytes in the blank must be below the Reporting Limit for that analyte in order for the blank to be considered acceptable. An exception is made for common laboratory contaminants (methylene chloride, acetone, 2-butanone, toluene, and bis 2-ethylhexylphthalate) which may be present in the blank at up to 5 times the reporting limit and still be considered acceptable. This policy is consistent with the CLP policy and has been established in recognition of the fact that these compounds are frequently found at low levels in method blanks due to the materials used in the collection, preparation and analysis of samples for organic parameters.

For metals analysis, the policy is that the concentration of the target analytes in the blank must be below two times the reporting limit. If the blank value for a target analyte lies below the reporting limit, the reporting limit for that analyte in the associated samples is unaffected. A blank containing an analyte(s) above two times the reporting limit is considered unacceptable unless the lowest concentration of the analytes in the associated samples is at least ten times the blank concentration (CLP protocol).

For conventional inorganic tests, the method SOP directs how the blank is treated. Generally, a reagent blank is used both to zero the equipment and as one of the calibration standards. If a preparation step is required for the analysis, then a preparation blank is also analyzed to determine the extent of contamination or background interference. In most cases, the concentration found in the preparation blank is subtracted from the concentration found in any

associated sample prior to calculating the final result. Blanks have no application or significance for some conventional inorganic parameters (e.g., pH).

If the blank does not meet acceptance criteria, the source of contamination must be investigated and appropriate corrective action must be taken and documented. Investigation includes an evaluation of the data to determine the extent and effect of the contamination on the sample results. Corrective actions may include reanalysis of the blank and/or repreparation and reanalysis of the blank and all associated samples.

For organic and metal analyses and selected conventional inorganic tests, method blank results are reported with each set of sample results. Sample results are not corrected for blank contamination. Occasionally, due to limited sample volume or other constraints, the laboratory reports data associated with an unacceptable blank.

16.2 FIELD BLANKS

Field blanks are check samples that monitor contamination originating from the collection, transport, or storage of environmental samples. One example of a field blank is an equipment blank. An equipment blank is reagent water that is poured through the sample collection device following decontamination procedures to check the adequacy of the cleaning procedures for the sampling equipment. Another type of field blank is a trip blank. A trip blank is a laboratory control matrix (typically water) which is sent to the field in an appropriate sample container, remains unopened in the field and then is sent back to the laboratory. The purpose of the field blank is to assess the impact of field and shipping conditions on the samples. The results from field blanks are reported to the client as a sample in the same concentration units as the samples themselves. No correction of the analytical data is done in the laboratory based on the analysis of field blanks.

16.3 MATRIX SPIKE / MATRIX SPIKE DUPLICATE (MS / MSD)

A Matrix Spike (MS) and a Matrix Spike Duplicate (MSD) are QC check samples that are derived from the division of a concurrently analyzed environmental sample into two additional

and separate aliquots. Each aliquot is spiked with known concentrations of analytes representative of the method. The two spiked aliquots are processed separately and the results compared to determine the effects of the matrix on the precision and accuracy of the analysis. Results are expressed as percent recovery and relative percent difference (RPD). In accordance with the above criteria, five (5) percent of all samples are spiked in duplicate with the parameter being analyzed and the most recent twenty (20) results of these spiked samples are used to generate control charts for both percent recovery and relative percent difference between analyses of duplicate samples. Control limits for accuracy for each analyte are based on the historical average recovery of the spike pairs under consideration plus or minus three standard deviation units. Control limits for precision for each analyte are established at zero (no difference between duplicate results) to three standard deviation units of the mean RPD.

16.4 LABORATORY CONTROL SAMPLES (LCS)

Laboratory control samples (LCS) are well characterized, laboratory generated samples used to monitor the laboratory's day-to-day performance of routine analytical methods. Laboratory control samples are reagent water that has been spiked with all method analytes or a group of analytes representative of the analysis. Because of the similarity of the LCS to a calibration standard, the source of the spiking material should be different than that of the calibration standards. Recoveries must meet acceptance criteria stated in the method SOP. Laboratory control samples are used to monitor the accuracy of the analytical process, independent of matrix effects. They are also used in conjunction with blanks to identify any background interference or contamination of the analytical system which may lead to the reporting of elevated concentration levels or false positive data. The fact that they are made from source materials different from calibration standards makes the LCS a good check for deteriorating or mislabeled standards.

16.5 SURROGATE SPIKES

Surrogates are organic compounds which are similar to the analytes of interest in chemical behavior, but which are not normally found in environmental samples. Surrogates are added to samples to monitor the effect of the matrix on the accuracy of the analysis. Results are reported in terms of percent recovery. The Toms River Corporate Remediation Laboratory routinely adds

surrogates to samples requiring GC / MS or GC analysis. The laboratory does not control its operations based on surrogate recoveries in environmental samples unless method specifically state the requirement. The surrogate recoveries are primarily used by the laboratory to assess matrix effects. However, obvious problems with sample preparation and analysis (e.g., evaporation to dryness, leaking septum, etc.) which can lead to poor surrogate spike recoveries must be ruled out prior to attributing low surrogate recoveries to matrix effects thereby requiring re-extraction / re-analysis.

Table 1 provides a brief summary of the frequency and control limits for the fundamental quality control measures performed for analyses by the laboratory. Additional types of quality control are performed as necessary.

16.6 PROFICIENCY TESTING

The Remediation Laboratory participates in a proficiency testing program to assure the quality of test results. The laboratory participates in the program as appropriate for a particular project or regulatory program.

Proficiency samples are handled and tested in the same manner (SOP, equipment, trained personnel) as normal environmental samples. Proficiency test sample data is archived with project records.

Table 1
Frequency and Control Limits

Parameter	QC Type	Frequency	Control Limits	Corrective Action
Volatile Organics	method blank	1 per batch	target analytes below RL, 10x exception for lab solvents	system check, reanalysis of associated samples
	surrogate spike	each sample, standard, blank	limits listed in method	review, reanalyze based on technical judgment
	MS/MSD	set per 20 samples per matrix	limits listed in method	report results
	LCS (Blank Spike)	1 per batch	limits listed in method	review, reanalyze LCS (Blank Spike) and associated samples, if appropriate
Semi-Volatile Organics	method blank	1 per 20 samples or each batch	target analytes below RL, 5x exception for common lab contaminates	reanalysis, if still out, reextract w/ samples
	surrogate spike	each sample, standard, blank	limits listed in method	review, reextract, based on technical judgment
	MS/MSD	set per 20 samples per matrix	limits listed in method	report results
	LCS (Blank Spike)	1 per 20 samples or each batch	limits listed in method	review, reextract w/ samples, if appropriate
Extractable Organics	method blank	1 per 20 samples or each batch	all compounds below RL	reanalysis, if still out, reextract w/ samples
	surrogate spike	each sample, standard, blank	limits listed in method	review, reextract, based on technical judgment
	MS/MSD	set per 20 samples per matrix	limits listed in method	report results
	LCS (Blank Spike)	1 per 20 samples or each batch	limits listed in method	review, reanalysis or reextract w/ samples, if appropriate
Metals	lab reagent/prep blank	1 per 20 samples or batch	analyte below RL	redigest batch
	LCS (Blank Spike)	1 per batch	Soils: limits provide by vendor; Waters: ±20%	redigest batch
	replicates	1 per 20 samples per matrix	±20%	flag results
	matrix spikes	1 per 20 samples per matrix	75-125%	flag results
Wet Chemistry	lab reagent/prep blank	1 per 20 samples or batch	analyte RL	system check, reanalysis of batch
	LCS (Blank Spike)	1 per batch	80-120% recovery	system check, reanalysis of batch
	replicates	1 per 20 samples per matrix	±20%	flag results
	matrix spikes	1 per 20 samples per matrix	75-125%	flag results

RL = Reporting Limit

17.0 STATISTICAL CONTROL LIMITS

The laboratory utilizes specific minimum acceptance limits established by the method or acceptance limits are generated by the analysis of quality control samples (20 data points). This allows any out-of-control parameters to be detected before data is reported. If the out-of-control parameter is judged to be sample related, the analysis may continue. The corrective action policy must be followed, and the result reported with a comment qualifying the results.

When an analysis is deemed out-of-control by the analyst performing the analysis, the reason for the out-of-control situation is investigated immediately. The response to the out-of-control situation will depend on the analysis and the SOP should be consulted. In addition, the Laboratory Manager is informed of the problem and does not allow any further analyses until the problem has been corrected. Corrections may include reassay of the check samples, recalibration, instrument maintenance or other SOP mandated operations. If it is necessary to report results obtained when the system is judged to be out-of-control, the corrective action policy will be followed, the data will be flagged on the laboratory analysis report, and a qualifying comment will be attached.

18.0 PROCUREMENT AND INVENTORY CONTROL

Chemical reagents, solvents, gases, glassware and general supplies are ordered as needed to maintain sufficient quantities on hand. Criteria for all equipment and reagents effecting data quality are well defined in the SOPs. Any item critical to the analysis, such as an instrument or reagent, received and accepted by the laboratory is documented. This includes type, age, and acceptance status of the item. Reagents are dated upon receipt and upon opening to establish their order of use and to minimize the possibility of exceeding their shelf life.

19.0 PROCEDURES FOR HANDLING TEST ITEMS – SAMPLE CUSTODY

Sample representativeness and integrity are the foundations upon which meaningful analytical results rely. A documented and approved sampling plan reflecting data quality objectives should be in place at the sampling site. The integrity of the sample should be maintained through the use of preservation techniques specified in the relevant protocols. Samples are submitted to the laboratory under standard chain-of-custody procedures. A copy of the laboratory *Chain of Custody* form can be found in **Attachment E.**

19.1 SAMPLE ACCEPTANCE POLICY

Upon receipt, samples proceed through an orderly processing sequence specifically designed to ensure continuous integrity of both the sample and its documentation. Samples are considered "compromised" if the following conditions are observed upon sample receipt:

- Color and/or samples are received outside of temperature specification.
- Samples are received broken or leaking.
- Samples are received beyond or close to the holding time.
- Samples are received without appropriate preservative.
- Samples are received in inappropriate containers.
- COC does not match samples received.
- COC is not properly completed or not received.
- Breakage of any Custody Seal.
- Apparent tampering with cooler and/or samples.
- Headspace in volatiles samples.
- Seepage of extraneous water or materials into samples.
- Inadequate sample volume.
- Illegible, impermanent, or non-unique sample labeling.

All samples are received by the Toms River Corporate Remediation Laboratory personnel and are carefully checked for label identification and matched to accompanying chain-of-custody records. Additionally, sample temperature and pH information are obtained and recorded, as are any unusual sample conditions such as breakage. Each sample is then assigned a unique laboratory identification number through a computerized Laboratory Information Management System (LIMS) that stores all identifications and essential information. The LIMS system tracks the sample from storage through the laboratory system until the analytical process is completed and the sample is disposed of. Internal chain-of-custody is maintained. Access to the Remediation Lab, LIMS and to the sample storage areas is restricted to preclude unauthorized contact with samples, extracts or documentation. The samples are stored in a limited access refrigerator maintained at one to four degrees centigrade. At an appropriate time, samples are lab-packed and disposed of as hazardous waste through the Toms River site waste-handling program.

An example of the Toms River Corporate Remediation Laboratory Chain-of-Custody Record used to transmit samples from the client to the laboratory is given in **Attachment E.** Sample bottles provided to the client by the laboratory are precleaned and batch analyzed and are transmitted under custody. Overall responsibility of the sample custody function is held by the Laboratory Manager.

19.2 SAMPLE PROCESSING PROCEDURE

19.2.1 SAMPLE CONTROL

- Check and document physical condition of sample.
- Verify documentation and analysis assignment.
- Log into LIMS.
- Send acknowledgement letter to client. (where applicable)

19.2.2 Proper Storage

- Store sample according to preservation guidelines.
- Transfer sample to lab with proper documentation.

19.2.3 Laboratory

- Document analytical work.
- Return used samples to Sample Control.

19.2.4 Sample Control

- Return sample to client or arrange for sample disposal in compliance with state and federal guidelines.

20.0 HOLDING TIMES AND PREPARATION OF SAMPLES

The holding time for every analysis is established in Federal or State regulations and is documented in the method SOP or on a project specific basis. Holding times are normally tracked by the Chemist/Technician using the LIMS. **Attachment B** provides detailed information on sample containers, sample preservatives, etc. Alternatively, the analytical method utilized will provide guidance for sample containers, sample preservation and hold times.

Work is scheduled by the Laboratory Manager and Section Supervisors to avoid expiration of any sample prior to analysis. If any holding times are not met, the laboratory informs the Laboratory Manager as soon as possible and the Laboratory Manager notifies the client.

Samples are prepared according to standardized methods. Batches are generated according to preparation method, analytical method, and matrix. In general, batches do not exceed 20 field samples of the same matrix and are defined as samples prepared at the same time.

Inorganics (Metals and Wet Chemistry) – Samples for analyses are prepared in batches containing a maximum of 20 samples of the same or similar matrix. A laboratory blank and laboratory control sample are digested with each batch. Matrix spikes (MS and MSD) and replicate analyses are performed for every 20 samples of the same matrix.

Organics – Samples for organics analyses are prepared in batches containing a maximum of 20 samples of the same or similar matrix. The organic extraction labs are equipped for handling many matrices and various clean-up requirements including Florisil, GPC, silica gel, acid-base, copper and sulfur. A method blank is performed with each batch. Lab control samples are extracted with each batch for applicable methods. Matrix spike and matrix spike duplicate analyses are performed for every 20 samples of the same matrix.

Re-preparation – Re-preparation or re-analysis of a sample may be required in cases of contamination, missed dilution, low surrogate recover, etc. Typically, if this reanalysis is

conducted outside of the holding time, the laboratory will be considered to have fulfilled its obligation to meet holding times if the preparation and/or analysis was initiated within the prescribed holding time. Additionally, a Corrective Action Report (**Attachment E**) is filed with the Laboratory Manager when the laboratory has initiated a re-preparation request.

21.0 PROCEDURES FOR CALIBRATION AND VERIFICATION

Calibration of instrumentation is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established reporting limits. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method.

Method specific SOPs discuss in detail how each instrument is calibrated, including frequency for calibration and re-calibration, and the source or grade of the calibration materials. The range of analyses performed and instrumentation utilized is extensive and the calibration procedures are instrument specific, varying from analysis to analysis. The calibration procedures for organics usually include an initial system performance check and some type of initial calibration (with a minimum of five calibration standards for most methods) with each analytical series. On-going and closing calibration checks are also included in most analytical series. For each type of calibration standard or performance check, there are specific criteria to meet before sample analyses begin. These criteria are established in the methodologies as they are written in the referenced texts or by contract specifications.

Gas Chromatography/Mass Spectrometry (GC/MS) – prior to analysis of samples, the instrument is tuned with bromofluorobenzene (BFB) for volatile compounds and decafluorotriphenyl-phosphine (DFTPP) for semi-volatile compounds or other tune criteria as specified by the method used. No samples are analyzed until the instrument has met the tuning criteria of the method.

In general, the instrument is then calibrated for all target compounds. An initial calibration curve is produced to define the working range to establish criteria for identification. This initial calibration is evaluated on a daily basis to ensure that the system is within calibration. If the daily standard does not meet the established criteria, the system is recalibrated.

Gas Chromatography – Each chromatographic system is calibrated prior to performance of analyses. Initial calibration consists of determining the working range, establishing limits of detection, and establishing retention time windows. The calibration is checked as required to ensure that the system remains within specifications. In addition, continuing calibrations are performed at frequencies required by the method used. If the calibration checks do not meet established criteria, corrective action that may include recalibration and reanalysis of samples is taken.

Metals – The Remediation Laboratory is currently evaluating the needs for purchase of metal analysis instrumentation for the OU-2 project. If purchased, analysis for metals will involve two types of analytical instrumentation: inductively coupled argon plasma emission spectroscopy (ICP), and atomic absorption spectroscopy (AA).

An ICP is calibrated prior to use by analyzing a multi-element calibration standard. The calibration is then verified using standards from an independent source. For CLP a linear range verification check standard is analyzed and reported quarterly for each element analyzed by ICP. This concentration is the upper limit of the ICP linear range and any result found above this limit must be diluted and reanalyzed. The calibration is monitored throughout the day by analyzing a Continuing Calibration Blank (CCB) and a Continuing Calibration Verification Standard (CCV). If the verification standard does not meet established criteria, corrective action is performed.

All samples for furnace analyses are single spiked. The method of standard additions or sample dilution is used when the single spike analysis indicates matrix interferences are present.

Wet Chemistry – The field of classical (wet) chemistry involves a variety of instrumental and wet chemical techniques. Calibration and standardization procedures vary depending on the system and analytical methodology required for a specific analysis. The calibration is checked on an ongoing basis to ensure that the system remains within specifications. If the ongoing calibration check does not meet established criteria, analysis is halted and corrective action is taken. The procedures include examination of instrument performance and recalibration and reanalysis of samples back to the previous acceptable calibration check.

Methods performed at the laboratory are validated prior to sample analysis. Method validation involves the determination of sensitivity and linearity and reproducibility studies. This would include but are not limited to writing appropriate method SOPs and performing method detection limit studies.

Method sensitivity is determined by method or instrument detection limit studies. The procedure to determine the method detection limit (MDL) follows 40CFR Part 136 Appendix B (revision 1.1). The reporting limit for a given analyte may be derived from the MDL. MDL studies are conducted annually on all routine analytical methods.

The MDL is the approximate limit at which an analyte can be *qualitatively* detected using a specific method at a 99% confidence interval. The MDL is a statistically calculated value and measures the sensitivity of an entire method and is independent of device. The RL or Limit of Quantitation is the limit at which a compound can be qualitatively detected and *quantified* at a 99% confidence interval. The RLs are also set based on specific knowledge about the analyte, project specific requirements and/or regulatory requirements. The RL is always greater than the MDL is typically set at 3-5 times the MDL.

Toms River Corporate Remediation Laboratory reports results to the calculated MDLs or to sample specific RLs. For most methods, the low calibration standard is set as the laboratory Reporting Limit (RL) to monitor method sensitivity per instrument per calibration. Sample specific RLs are derived by taking into account various sample specific data, which can include the amount of the sample subject to testing, percent moisture, dilution factors, interferences and the base RLs for the analysis.

In some cases, it is appropriate to report values between the MDL and the RL. In this region, an analyte can be qualitatively detected, but not accurately quantified. Any data point reported in this region is flagged with a "J" for organics and a "B" for inorganics, to indicate that it is an estimated value.

22.0 DATA REDUCTION

The individual analysis on the report are initially received by the analyst while performing the testing. The analyst ensures that all quality control information is in-control and correct before processing the data. In general, an analyst will process data in one of the following ways:

- Manual computation of results with manual reporting.
- Computer computation of results with manual reporting.
- Computer computation and reporting of results.

If the analyst manually processes the data, all steps in the computation are provided for review including the source of the input parameters such as response factors, dilution factors, and calibration constants. All calculations of manually processed data are checked during secondary review.

For data that is processed using a computer and then entered into the LIMS by an analyst or data entry personnel, a hard copy of the computer generated results is kept and uniquely identified with the sample number and any other preparation or dilution information as may be needed. The hard copy results are used for data validation and secondary review.

If computer processed data is directly acquired from the instrumentation, hard copies of the actual data are made and the analyst verifies that the following are correct before releasing instrumental data to the reporting system:

- Sample numbers
- Calibration constants / response factors
- Output parameters such as units and compound names
- Numerical values used for detection limits
- Dilution and preparation factors

The hard copy of the results is used for data validation and review. After initial demonstration of proficiency of computerized programs, computer calculations are randomly spot checked while the manual entry of every result is verified.

23.0 DATA REVIEW

The analyst who generates the data (i.e., log in, prepares and/or runs the samples) is responsible for primary review. The primary review is often referred to as "bench-level" review. One of the most important aspects of primary review is to make sure that the test instructions are clear, and that all project specific requirements have been understood and followed. Once the analysis is complete, the primary reviewer ensures that sample preparation information is complete, accurate and documented, calculations have been performed correctly, quantitation have been performed accurately, qualitative identifications are accurate, client specific requirements have been followed, method and process SOPs have been followed, method QC criteria have been met, QC samples are within established limits, dilution factors are correctly recorded and applied, non-conformances and/or anomalous data have been properly documented and appropriately communicated, and COC procedures have been followed. If the instrument calibration and recoveries of all quality control samples are within specified tolerances, then the data are presented for secondary review. If instrument calibration or the recoveries of any quality control samples exceed specified tolerances, then affected sample results are evaluated and, generally, the samples are submitted for re-analysis. Any manual integration that occurs are dated and signed and, if appropriate, noted in the case narrative.

Secondary review (a complete technical review) is typically conducted by the Laboratory Manager to determine if analytical results are acceptable. All calibrations, manual calculations and transcriptions are checked for accuracy and quality control sample results are evaluated against specific tolerances. If discrepancies or deficiencies exist in the analytical results, then corrective action is taken.

Correlation of results for different parameters of a sample is evaluated at this time before the data is presented in a final project report.

24.0 DATA REPORTING

All of the information necessary for the interpretation of the test results and all information required by the methods used is included on the project analysis report.

The content criteria listed below apply to all project reports:

- Title
- Laboratory Name
- Unique Laboratory Project Number
- Total Number of Pages (report must be paginated)
- Name of Analyst
- Project Name (if applicable)
- Laboratory Sample Identification
- Sample Identification
- Matrix and/or Description of Sample
- Dates: Sample Receipt, Collection, Preparation and/or Analysis Date
- Definition of Data Qualifiers
- Reporting Units
- Test Method

The following are required where applicable to the specific test method or matrix:

- Solid Samples: Indicate Dry or Wet Weight
- Indication by flagging where results are reported below the quantitation limit.

A Project Narrative and/or Cover Letter is included with each project report and at a minimum includes an explanation of any and all of the following occurrences:

- Non-conformances
- "Compromised" sample receipt (see Section 19.0)
- Method Deviations
- QC criteria failures

The Laboratory Manager or his/her designee authorizes the releases of the project report with a signature.

If revisions to project reports are required after issue, a revised report will be in the form of a separate document and/or electronic data deliverable. The revised report is clearly identified as revised with the date of revision and the initials of the person making the revision. Specific pages of a project report may be revised using the above procedure with an accompanying cover letter indicating the page numbers of the project revised. The original version of the project report must be kept intact and the revisions and cover letter included in the project files.

Subcontracted data is clearly identified as such, and the name, address, and telephone number for the laboratory performing the test is included in the project report. Subcontracted results from laboratories external to Toms River Corporate Remediation Laboratory are not reported on Toms River Corporate Remediation Laboratory report forms or Toms River Corporate Remediation Laboratory letterhead.

Electronic Data Deliverables (EDD) are routinely offered as part of the Toms River Corporate Remediation Laboratory's services. The laboratory offers a variety of EDD formats like spreadsheet data summary in Excel.

The Toms River Corporate Remediation Laboratory offers a wide range of project reporting formats, including EDDs, short report formats, and complete data deliverable packages modeled on the Contract Laboratory Protocol (CLP) guidelines.

After all analytical data has been reviewed, the final report is assembled for submission to the client. The laboratory currently offers four levels for reporting analytical results.

Results data consist of measurements taken during field analysis with the report consisting of results only.

Results/QC reporting consists of an analytical report with results and Internal quality control results.

Reduced Deliverables reporting consists of an analytical report with internal quality control results reported; these include laboratory control standards, surrogate spike recoveries, and method blank results.

Regulatory Format (RF) refers to data submitted in CLP-like format. RF is defined by the submission of QA/QC supporting material including the raw laboratory data similar to that provided with CLP Statements of Work (SOW). RF reporting includes narrative, analytical results, supportive documentation including all raw data and preparation sheets, and all documentation related to chain of custody. Once the document is assembled, the sections are distinguished with index tabs. The pages are paginated in numerical order and photocopied. Copy(s) of the documentation are sent to the client, and the original document is retained in storage for a minimum of five (5) years.

25.0 DOCUMENT CONTROL

The following documents are controlled at Toms River Corporate Remediation Laboratory:

- Quality Assurance Manual
- Standard Operating Procedures (SOP)

Security and control of documents is necessary to ensure that confidential information is not distributed and that all current copies of a given document are from the latest applicable revision. Unambiguous identification of a document is through a header placed in the upper right or left hand corner of each page. The header contains the document name, revision number, revision date and number of pages.

Standard Operating Procedures (SOPs) contain the basic procedures and practices the laboratory uses to analyze a method. These procedures provide a basis for training new associates and for showing customers how analyses are performed.

SOPs are written procedures for standardized methods (i.e., SW-846, EPA-600 methods) and are supplied primarily to document specific laboratory procedures used to satisfy the general requirements specified in the individual methods and to explain any differences between the application of the established method and the published procedure. If any difference exists between the Toms River Corporate Remediation Laboratory's SOP and a standard method's specific procedures, method validation studies are performed to document the fact that the change does not adversely affect the applicability of the method. In general, every effort is made to adhere to the protocols of the standard method.

26.0 RECORDS

The laboratory retains all records related to sample analysis including raw data, calculations, derived data, calibrations and test reports. These records are maintained in a systematic manner for a minimum of five (5) years. Longer periods of storage may be arranged at the time of project initiation.

Mistakes are never erased deleted or written over. They are corrected by drawing a single line through the error and entering the correction alongside. The correction is then initialed and dated by the responsible person.

Each log book page or, as required, each entry is dated and initialed by the analyst at the time the record is made. Pages inserted into logbooks are taped or glued onto a clean, bound page. Specific information on the types of logbooks, format of entry, and other pertinent information are contained in the appropriate sectional SOPs.

The Laboratory Manager and/or Laboratory Chemists and Technicians periodically review laboratory notebooks for accuracy, completeness, and compliance to this QAM. If all entries on the pages are correct, then the Laboratory Manager or the Chemist/Technician initials and dates the reviewed pages.

Corrective action is taken for erroneous entries before the Laboratory Manager signs off with approval.

27.0 PERFORMANCE ASSESSMENT

The Remediation Laboratory only services the Corporate Remediation Department and, as such, does not retain certification by any State or Federal Government Agency. However, the laboratory does perform analyses of performance evaluation samples periodically. Performance evaluation samples for water and soil matrices will be submitted as a separate submission to the regulatory agency.

Performance evaluation samples for air analysis are not available, but the laboratory will also submit analysis of a known spiked air sample, which includes the chemicals of concern, to demonstrate its ability to produce accurate results.

28.0 CORRECTIVE ACTION

When errors, deficiencies, or out-of-normal situations exist, the QA program provides systematic procedures, called "corrective actions" to resolve problems and restore proper functioning to the analytical system. Any laboratory employee is authorized to initiate corrective action.

Laboratory personnel are alerted that corrective actions may be necessary if:

- QC data are outside the acceptance limits for precision and accuracy;
- Blanks contain contaminants outside of acceptable limits;
- Undesirable trends are detected in spike recoveries or RPD between duplicates;
- There are unusual changes in detection limits;
- Deficiencies are detected by the Laboratory Manager during internal or external audits or from the results of performance evaluation samples; or
- Inquiries concerning data quality are received from project managers.

Corrective action procedures are often handled at the bench level by the analyst, who reviews the preparation or extraction procedure for possible errors, checks the instrument calibration, spike and calibration mixes, instrument sensitivity, and so on. If the problem persists or cannot be identified, the matter is referred to the Laboratory Manager for further investigation. Once resolved, full documentation of the corrective action procedure is filed. Corrective action documentation (**Attachment E**) is routinely reviewed by the Laboratory Manager.

29.0 CORRECTION OF ERRONEOUS REPORTS

The discovery that, for whatever reason, an erroneous result has been released initiates immediate corrective action to rectify the error. If the error is discovered internally then the client is immediately notified by the Laboratory Manager to prevent use of the incorrect report for decision making. If a client or validator has a question or finds a deficiency concerning the data submittal, the Laboratory Manager is responsible for communicating and implementing the corrective action in the laboratory. The analytical results and all supportive documentation in question are submitted to the appropriate section for evaluation. Should a re-analysis be necessary, it is initiated if the sample is still available using a Corrective Action Report Form (**Attachment E**). If the re-analysis is out of holding time the result is qualified. If revisions to the report are necessary, corrections are made, initialed and dated; or if the complete new report (resubmission) is requested, all the pages with addendum are renumbered.

Hard copies and revised electronic deliverables (where applicable) are given to the Laboratory Manager for re-submission to the client or validator. Revision of the case narrative, should it become necessary, is the responsibility of the Laboratory Manager. In some instances, clients request that sample handling information, recalculations or qualitative judgments are re-checked in order to ensure data integrity. In this case, resubmission of the data may not be necessary unless a problem is detected.

30.0 DEPARTURES FROM POLICIES

Departures from laboratory Standard Operating Procedures are not permitted unless the approval of the Laboratory Manager is obtained prior to implementation of the departure. These exceptions must be documented with a SOP and/or highlighted in the case narrative, which accompanies the analytical results. Additionally, method validation studies and method detection limit studies are performed as applicable.

31.0 AUDIT

The Remediation Laboratory does not participate in state and federal programs. The laboratory seeks to perform project-specific analysis under the guidance of the EPA or State at the Corporation remediation sites. As such, the Laboratory Manager will conduct quarterly internal audits and formally document the findings.

The audit program is focused on the following areas:

- Maintenance of acceptable and complete SOPs
- Maintenance of training records
- Maintenance of notebooks
- Maintenance of instrument records
- Evaluation of standard control records
- Evaluation of sampling handling procedures
- Evaluation of data handling and storage procedures

32.0 QUALITY SYSTEM REVIEW BY MANAGEMENT

A review of the quality system is conducted annually. Management, including but not limited to the Laboratory Manager reviews all aspects of the laboratory's quality system. The purpose of this review is to ensure the suitability and effectiveness of the Toms River Corporate Remediation Laboratory's program as well as provide opportunity for improvements. The review includes the following topics:

- Reports from audits by clients and regulatory agencies
- Reports from internal audits
- Results of proficiency studies
- Corrective actions from the past year and a review of their implementation
- Details of complaints from clients and their resolution
- Training goals and objectives
- Staff, facility and equipment resources
- Future plans and goals

In addition to this annual review, daily meetings occur to communicate issues and needs which arise during the course of operations.

33.0 TERMS AND DEFINITIONS

Accuracy – the degree of agreement between a measurement and true or expected value, or between the average of a number of measurements and the true or expected value.

Audit – a systematic evaluation to determine the conformance to specifications of an operational function or activity.

Batch – environmental samples, which are prepared and/or analyzed together with the same process, using the same lot(s) of reagents. A preparation batch is composed of environmental samples of the same matrix. Where no preparation method exists (e.g., volatile organics, water) the batch is defined as environmental samples that are analyzed together with the same process, reagents and personnel. An analytical batch can also include prepared samples originating from various environmental matrices and can exceed 20 samples.

Chain of Custody (COC) – an unbroken trail of accountability that ensures the physical security of samples, data and records.

Confirmation – verification of the presence of a component using an additional analytical technique. These may include second column confirmation, alternate wavelength, derivatization, mass spectral interpretation, alternative detectors, or additional cleanup procedures.

Corrective Action – action taken to eliminate the causes of an existing non-conformance, defect or other undesirable situation in order to prevent recurrence.

Data Audit – a qualitative and quantitative evaluation of the documentation and procedures associate with environmental measurements to verify that the resulting data are of acceptable quality.

Demonstration of Capability (DOC) – procedure to establish the ability to generate acceptable accuracy and precision.

Document Control – the act of ensuring that documents (electronic or hardcopy and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly, and controlled to ensure use of the correct version at the location where the prescribed activity is performed.

Equipment Blank – a portion of the final rinse water used after decontamination of field equipment; also referred to as Rinsate Blank and Equipment Rinsate.

Field Blank – a blank matrix brought to the field and exposed to field environmental conditions.

Holding Time – the maximum time that a sample may be held before preparation and/or analysis as promulgated by regulation or as specified in a test method.

Instrument Blank – a blank matrix that is the same as the processed sample matrix (i.e., extract, digestate, condensate) and introduced onto the instrument for analysis.

Internal Chain of Custody – an unbroken trail of accountability that ensures the physical security of samples, data and records. Internal Chain of custody refers to additional documentation procedures implemented within the laboratory that includes special sample storage requirements, and documentation of all signature and/or initials, dates and times of personnel handling specific samples or sample aliquots.

Instrument Detection Limit (IDL) – the minimum amount of a substance that can be measured on a specific instrument, with a specified degree of confidence that the amount is greater than zero. The IDL is associated with the instrumental portion of a specific method only, and sample preparation steps are not considered in its derivation. An IDL value, by definition, has an uncertainty of ±100%. The IDL thus represents a range where qualitative detection occurs on a specific instrument. Quantitative results are not produced in this range.

Laboratory Control Sample (LCS) – a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

Matrix – the substrate of a test sample. Common matrix descriptions are listed in the Table below.

Matrix	Description
Aqueous	Aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine source. Includes surface water, groundwater and effluents.
Drinking Water	Aqueous sample that has been designated a potable water source.
Saline	Aqueous sample from an ocean or estuary, or other salt-water source such as the Great Salt Lake.
Liquid	Liquid with <15% settleable solids.
Solid	Soil, sediment, sludge or other matrices with ≥15% settleable solids.
Waste	A product or by-product of an industrial process that results in a matrix not previously defined.

Matrix Duplicate (MD) – duplicate aliquot of a sample processed and analyzed independently; under the same laboratory conditions; also referred to as Sample Duplicate, Laboratory Duplicate.

Matrix Spike (MS) – field sample to which a known amount of target analyte(s) is added.

Matrix Spike Duplicate (MSD) – a replicate matrix spike.

Method Blank – a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

Method Detection Limit (MDL) – the minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero. Also referred to as Limit of Detection (LOD).

Non-conformance – an indication, judgment, or state of not having met the requirements of the relevant specifications, contract, or regulation.

Precision – an estimate variability. It is an estimate of agreement among individual measurements of the same physical or chemical property, under prescribed similar conditions.

Preservation – refrigeration and/or reagents added at the time of sample collection to maintain the chemical, physical and/or biological integrity of the sample.

Proficiency Testing – determination of the laboratory calibration or testing performance by means of inter-laboratory comparisons.

Proficiency Test (PT) Sample – a sample, the composition of which unknown to the analyst, that is provided to test whether the analyst/laboratory can produce analytical results within specified performance limits.

QAM (Quality Assurance Manual) – a document stating the quality policy, quality system and quality practices of the laboratory. The QAM may include by reference or other documentation relating to the laboratory's quality system.

Quality Assurance (Project) Plan (QAPP) – a formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved.

Quality Control (QC) – the overall system of technical activities, the purpose of which is to measure and control the quality of a product or service.

Quality Control Sample – a control sample generated at the laboratory or in the field, or obtained from an independent source, used to monitor a specific element in the sampling and/or testing process.

Quality System – a structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA/QC.

Quantitation Limit (QL) – the lowest point at which a substance can be quantitatively measured with a specified degree of confidence using a specific method. The QL can be based on the MDL, and is generally calculated as 3-5 times the MDL, however, there are analytical techniques and methods where this relationship is not applicable. Also referred to as Practical Quantitation Level (PQL), Estimated Quantitation Level (EQL).

Raw Data – any original information from a measurement activity or study recorded in laboratory notebooks, worksheets, records, memoranda, notes, or exact copies thereof and that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic/optical media including dictated observations, and recorded data from automated instruments. Reports specifying inclusion of "raw data" do not need all of the above included, but sufficient information to create the reported data.

Record Retention – the systematic collection, indexing and storage of documented information under secure conditions.

Reference Standard – a standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived.

Reporting Limit (RL) – the level to which data is reported for a specific test method and/or sample. The RL is generally related to the QL. The RL must be minimally at/or above the MDL.

Resource Conservation and Recovery Act (RCRA) – legislation under 42 USC 321 et seq. (1976).

Safe Drinking Water Act (SDWA) – legislation under 42 USC 300f et seq. (1974) (Public Law 93-523).

Sampling and Analysis Plan (SAP) – a formal document describing the detailed sampling and analysis procedures for a specific project.

Selectivity – the capability of a method or instrument to respond to a target substance or constituent in the presence of non-target substances.

Sensitivity – the capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.

Spike – a known amount of an analyte added to a blank, sample or sub-sample.

Standard Operating Procedure (SOP) – a written document which details the method of an operation, analysis or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks.

Storage Blank – a blank matrix stored with field samples of a similar matrix.

Test Method – defined technical procedure for performing a test.

Traceability – the property of a result of a measurement that can be related to appropriate international or national standards through an unbroken chain of comparisons.

Trip Blank – a blank matrix placed in a sealed container at the laboratory that is shipped, held unopened in the field, and returned to the laboratory in the shipping container with the field samples.

ATTACHMENT #3

LABORATORY QUALITY ASSURANCE PROJECT PLAN

May 16, 2002
(Revised July 1, 2004)

GROUP A

PROJECT MANAGEMENT

A1. Title and Approval Sheet

Laboratory Quality Assurance Project Plan

Lancaster Laboratories, Inc.

Approving Official:

Kathleen M. Loewen

Kathleen Loewen, B.S., Quality Assurance Officer

7/08/04

Date

A2. Table of Contents

A3. Distribution List

This is a generic QA Project Plan; therefore, a distribution list will not be included. A list of organizations and persons that receive the generic QA Project Plan is maintained at Lancaster Laboratories.

A4. Project/Task Organization

The objectives of the laboratory Quality Assurance Program are to establish procedures which will ensure that data generated in the laboratory are within acceptable limits of accuracy and precision, to ensure that quality control measures are being carried out, and to ensure accountability of the data through sample and data management procedures. To this end, a Quality Assurance Department has been established. The Quality Assurance Officer reports directly to the President of Lancaster Laboratories and has no direct responsibilities for data production, thus avoiding any conflict of interest. The Quality Assurance Officer is the responsible party for maintaining the official, approved QA project plan.

The attached organizational charts show key managerial personnel. Resumes of key individuals may be found in the *Environmental Quality Policy Manual.*

The Sample Administration Group will be responsible for receiving samples, signing the external chain of custody, checking sample condition, assigning unique laboratory sample identification numbers, and initiating internal chain-of-custody forms. Sample Support personnel will be responsible for assigning storage locations, checking and adjusting preservation, homogenizing the sample as needed, and discarding samples. The Bottles Group is responsible for pre-preserving bottles as required by the method, preparing trip blanks and field blanks when required, and packing the bottle kits, then sending them to the client's requested location.

Group leaders listed in each technical area are responsible for performing laboratory analyses, quality control as specified in the methods, instrument calibration, and technical data review. Data is reported using a computerized sample management system, which tracks sample progress through the laboratory and generates client reports when all analyses are complete. Quality control data is entered onto the same system for purposes of charting and monitoring data quality.

The Quality Assurance Department is responsible for reviewing quality control data, conducting audits in the laboratory and reporting findings to management, maintaining current copies of all analytical methods, reviewing and approving Standard Operating Procedures (SOPs), submitting blind samples to the laboratory, and ensuring that appropriate corrective action is taken when quality problems are observed.

Data package deliverables are available upon request. The Quality Assurance Department reviews a representative sampling of the deliverables for completeness and to ensure that all quality control checks were performed and met specifications. This step includes a review of holding times, calibrations, instrument tuning, blank results, duplicate results, matrix spike results, surrogate results, and laboratory control samples (where applicable). Every attempt to meet specifications will be made, and any item outside of the specifications will be noted in the narrative. The laboratory will not validate data with regard to usability since this generally requires specific knowledge about the site. All data is archived according to corporate procedures.

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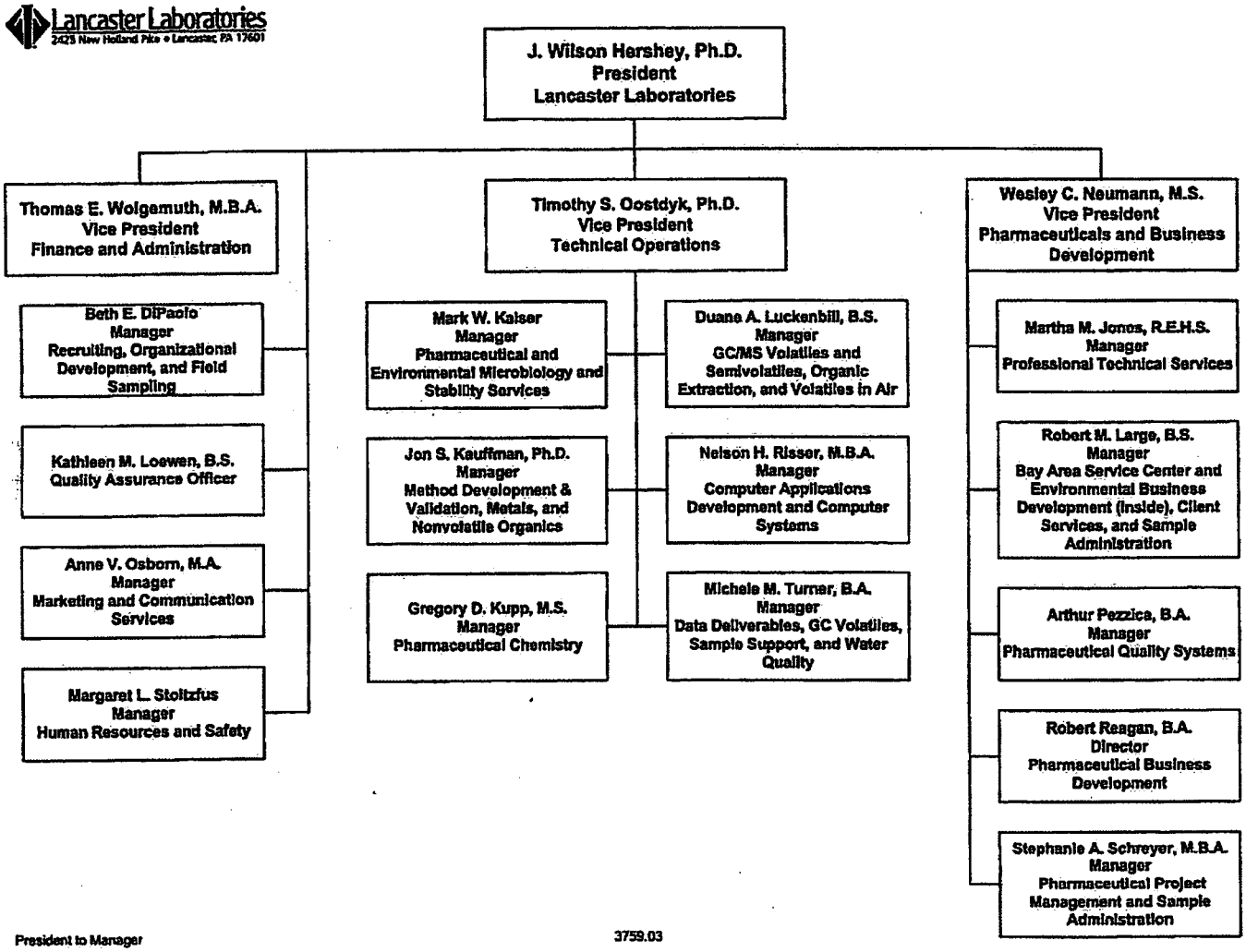
2425 New Holland Pike • Lancaster, PA 17601



President to Manager

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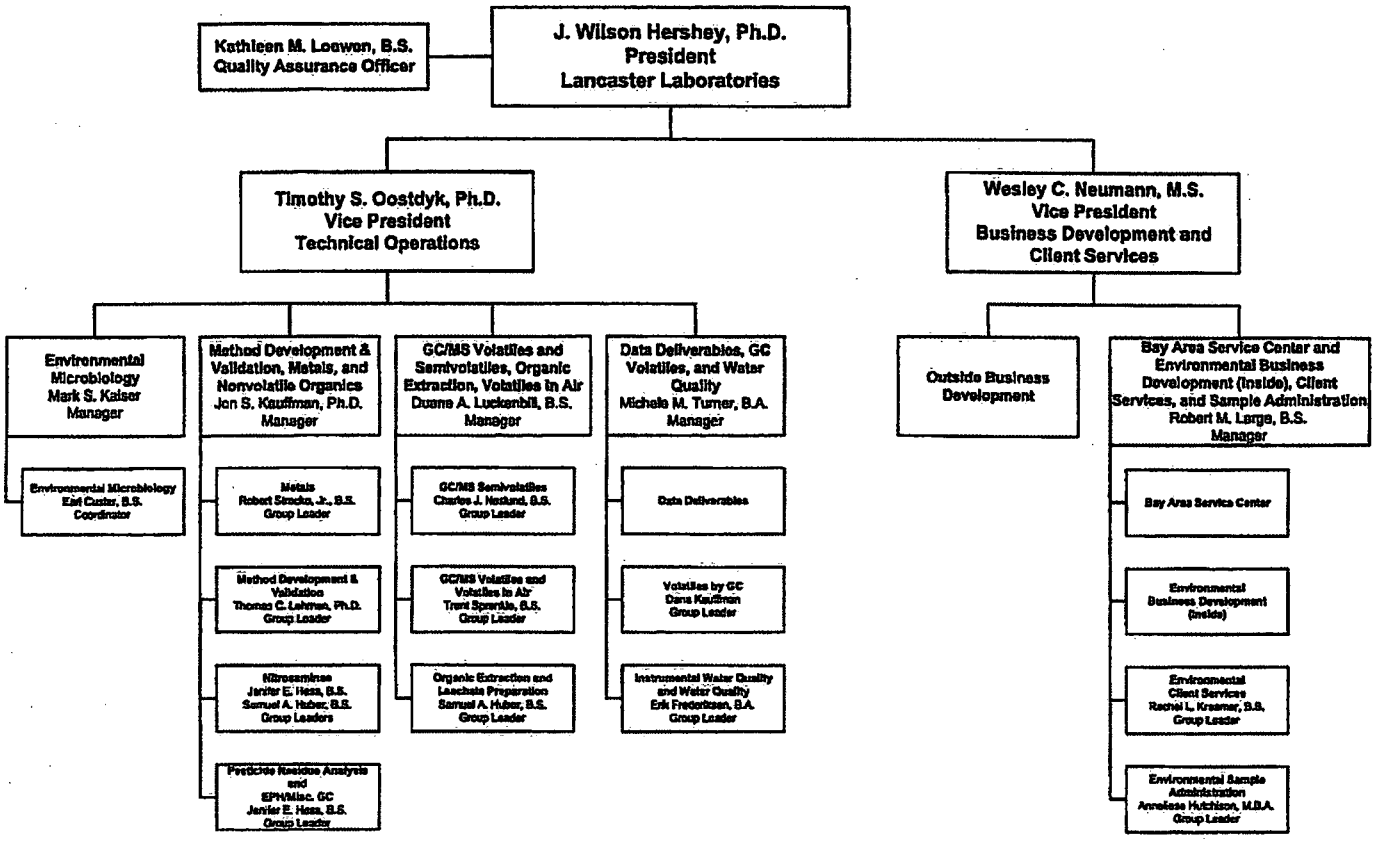
Environmental Sciences



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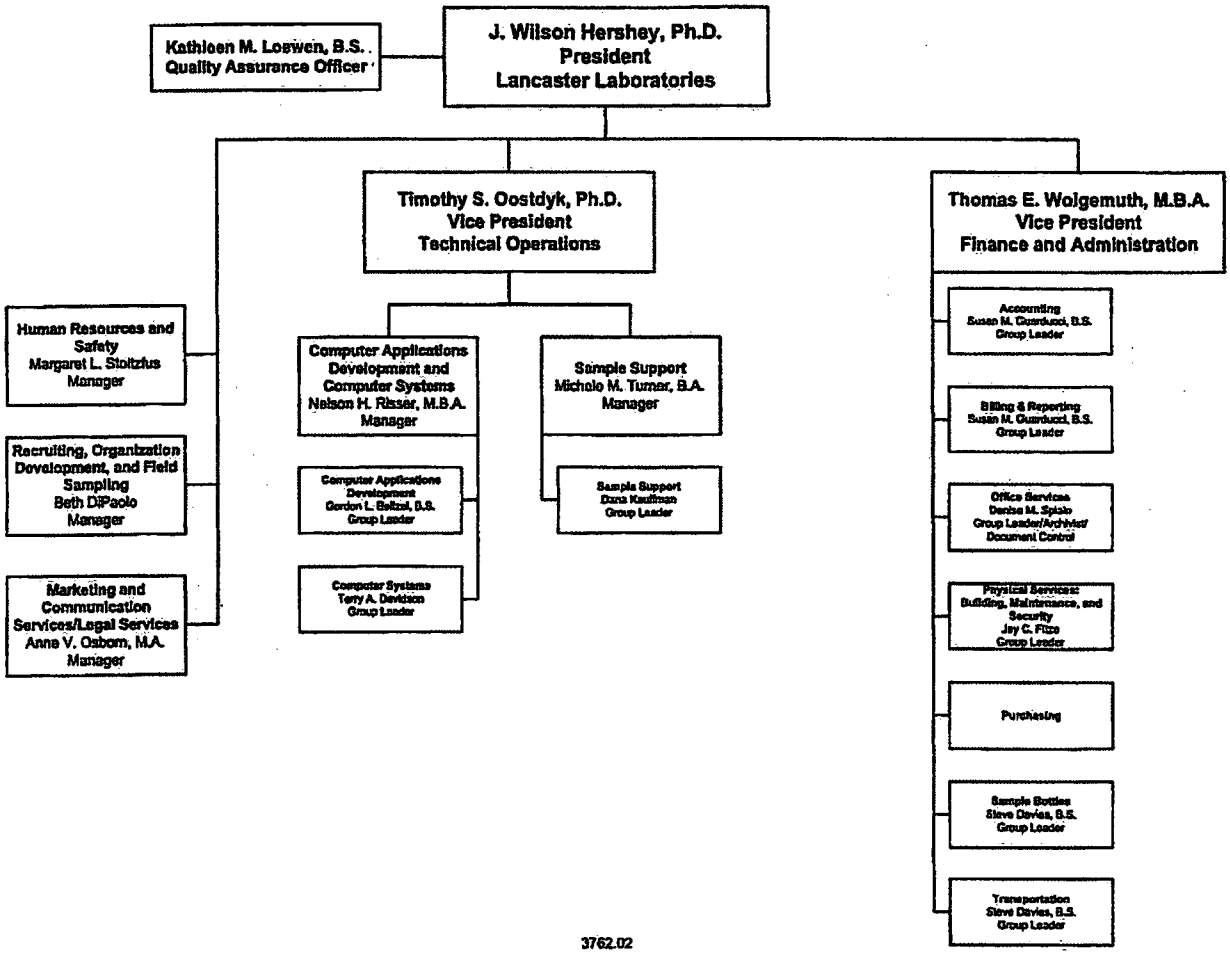
Support Services



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A5. Problem Definition/Background

The purpose of this generic QA Project Plan is to provide specific quality assurance and quality control procedures involved in the generation of data of acceptable quality and completeness. This QA Project Plan provides the laboratory requirements to meet *EPA Requirements for Quality Assurance Project Plans*, EPA QA/R-5, March 2001 and EPA's *Guidance for Quality Assurance Project Plans*, EPA QA/G-5, December 2002.

The procedures in this QA Project Plan have been standardized to make them applicable to all types of environmental monitoring and measurement projects. However, under certain site-specific conditions, not all of the procedures discussed in this document may be appropriate. In such cases, it will be necessary to adapt the procedures to the specific conditions of the investigation.

The analyses in this document are representative of what the laboratory performs but are not all encompassing. It is intended to provide a client with an overview of systems and procedures at Lancaster Laboratories. It is not project or site-specific and may not address all analyses required for a particular project. If additional analytical information is necessary, arrangements can be made with Lancaster Laboratories to generate a project specific or site specific QAPP.

A6. Project/Task Description

Tests will be performed according to the analytical methodology set forth in the *USEPA Test Methods for Evaluating Solid Waste—Physical/Chemical Methods, SW-846, 3rd edition, Update III, December 1996* and *Methods for Chemical Analysis of Waters and Wastes, USEPA, 600/4-79-020.* SW-846 provides specific analytical procedures to be used and defines the specific application of these procedures. Proven instruments and techniques will be used to identify and measure the concentrations of volatiles, semivolatiles, and pesticide compounds and/or the inorganic elements. The laboratory will employ state-of-the-art GC/MS and/or GC techniques to perform all organic analysis. Inorganic analyses will be performed using graphite furnace atomic absorption spectophotometry (GFAA), inductively coupled plasma (ICP), cold vapor AA, and ICP-MS. Instrumental wet chemistry will be using an auto-analyzer spectrophotometer, TOC analyzer, TOX analyzer, and Ion Chromatography. Classic wet chemistry will use appropriate instrumentation. The client is responsible for providing specifics on the project site.

A7. Quality Objectives and Criteria

Quality assurance is the overall program for assuring reliability of monitoring and measurement data. Quality control is the routine application of procedures for obtaining set standards of performance in the monitoring and measurement process. Data quality requirements are based on the intended use of the data, the measurement process, and the availability of resources. The quality of all data generated and processed during this investigation will be assessed for precision, accuracy, representativeness, comparability, and completeness. These specifications will be met through precision and accuracy criteria as specified in Element B5. Detection limits are presented in Element B4.

To ensure attainment of the quality assurance objectives, SOPs are in place detailing the requirements for the correct performance of laboratory procedures. As described in LOM-SOP-LAB-201, "Writing and Reviewing Lancaster Laboratories Policies and Operating Procedures," the laboratory SOPs are written and organized into a four-tiered hierarchy:

1. Corporate policies and *Quality Policy Manuals*

2. Laboratory Operations Manual SOPs

3. Departmental Procedures

4. Quality Records (notebooks, logbooks, forms, etc.)

All SOPs are approved by the QA Department prior to implementation. The distribution of current SOPs and archiving of outdated ones are controlled by the Office Services Group through a master file. Additional information is provided in the *Environmental Quality Policy Manual* (*EQPM*), including general information on Document Control, Archiving, an index of our SOPs, etc. Table A7-1 provides an index of SOPs in place in support of the Quality Assurance objectives. These requirements are supplemented by the procedures in the laboratory and analytical SOPs.

Table A7-1

Document #	Document Title
EQPM	Environmental Quality Policy Manual
LOM-SOP-ES-209	Investigation and Corrective Action of Noncompliant Data
LOM-SOP-ES-212	Internal Chain-of-Custody Documentation
LOM-SOP-ES-213	Quality Control Records
LOM-SOP-ES-215	Subcontracting to Other Laboratories
LOM-SOP-ES-216	Proficiency Test Samples
LOM-SOP-ES-219	Documentation for the Parallax Analysis Information Function
LOM-SOP-ES-220	Sample Storage and Discard
LOM-SOP-ES-221	Analytical Methods for Nonstandard Analyses
LOM-SOP-ES-222	Instrument and Equipment Maintenance and Calibration
LOM-SOP-ES-223	Missed Holding Time Reports
LOM-SOP-ES-224	Data Rounding, Parallax Entry, Verification and Reporting
LOM-SOP-ES-225	Reagents and Standards
LOM-SOP-ES-226	Validation and Authorization of Analytical Methods
LOM-SOP-LAB-201	Writing and Reviewing Lancaster Laboratories Policies and Operating Procedures
LOM-SOP-LAB-202	Document Control
LOM-SOP-LAB-203	Data and Record Storage, Security, Retention, Archival, and Disposal
LOM-SOP-LAB-204	Regulatory Training
LOM-SOP-LAB-210	Employee Training Program
LOM-SOP-LAB-217	Investigation and Corrective Action Reporting for Laboratory Problems
LOM-SOP-LAB-218	Procurement of Laboratory Supplies

Table A7-1 – Continued

Document #	Document Title
LOM-SOP-LAB-220	Laboratory Notebooks, Logbooks, and Documentation
LOM-SOP-VAL-201	Evaluation of Vendors of New Equipment, Instrumentation, Computerized Systems, and Computer Software
LOM-SOP-VAL-202	Validation Inventory and Schedule
LOM-SOP-VAL-203	Validation Documentation
LOM-SOP-VAL-204	Retrospective Validation of Existing (Legacy) Systems
LOM-SOP-VAL-205	Change Control
LOM-SOP-VAL-206	21 CFR Part 11 Compliance Action Procedure
LOM-SOP-VAL-207	Requirements for Purchasing and Implementing New Systems
SOP-QA-127	Handling of Client Technical Complaints (Investigations and Response)
SOP-QA-128	Compliance with Good Laboratory Practice (GLP) Regulations
SOP-QA-133	Guidelines for Analytical Decision Making

A8. Specialized Training/Certification

Lancaster Laboratories has a core curriculum of training that contains the basic courses relevant to all the employees. This in part, includes teaching the quality policy, quality assurance/quality control, ethics training, chemical hygiene training, health and safety classes, and any function specific training (i.e. GC, Statistics). Much of this training is performed at Lancaster Laboratories through the Human Resources Group. The following list shows examples of course offerings:

- Laboratory Technician Program: Designed for new employees who need to develop laboratory skills or who need a refresher on laboratory basics.
- Making Quality A Science: This course introduces why quality is important, explains Lancaster Laboratories quality philosophy and processes, and shows how to apply quality thinking and techniques on the job.
- Putting Our Values to Work: This seminar is designed to introduce new employees to the Statement of Values by examining how it translates to everyday jobs and includes ethical decision making.
- Chemical Hygiene Plan: Introduces the new employee to LLI's Chemical Hygiene Plan and the OSHA Lab Standard regulation and requirements.
- CPR: This course includes CPR history, relevance of CPR, cardiovascular disease, adult one-rescuer CPR, airway obstruction, safety in CPR, and use of the Automated External Defibrillator (AED).
- 24-hour HAZWOPER Emergency Response: Part of a proactive safety and emergency preparedness effort, this training is provided to a core group of people and volunteers who may respond to emergencies.
- Statistical Analysis: Topics include: rounding, mean standard deviation, normal distribution, z-scores, estimate, confidence intervals, hypothesis testing, one sample t-test, F-test, two sample t-test, paired t-test, ANOVA, outlier, calibration, etc.
- Gas Chromatography: Principles in GC, separation, qualitative/quantitative analysis, hardware, software, troubleshooting techniques, and the applications for GC use at Lancaster Laboratories.
- GC/MS Basics: Review of the fundamentals for GC/MS analysis.
- HPLC: Principles and practices on HPLC and the applications at Lancaster Laboratories.

If the training can not be accomplished at Lancaster Laboratories, then the employee may have off-site training. Within each technical or support group, the employee also receives on-the-job training before performing work independently. The details of this training are noted in each departmental group's SOPs.

The analysts must perform an initial demonstration of capability before using any test method; this is reviewed and signed by the technical department's management and Quality Assurance. The analyst must also complete an annual demonstration of capability for each test method per matrix.

All training and proficiencies are documented in each employee's training records as described in LOM-SOP-LAB-210, "Employee Training Program."

A9. Documents and Records

The group leaders in each technical area are responsible for overseeing the performance of analysis, quality control as specified in the method, instrument calibration, and technical data review. There is a secondary review on 100% of all data by a supervisor or experienced analyst prior to reporting the results. The Laboratory Information Management System (LIMS) tracks sample progress through the laboratory and generates client reports. During analysis, raw data must be recorded in indelible ink in bound notebooks or on printouts from instruments and is then entered into the LIMS against sample number and analytical method. Many instruments' data systems can transfer data directly to the LIMS, eliminating manual transcription. Quality control data is entered into the same system for purposes of charting and monitoring data quality. When all analyses are completed and have been verified by a supervisor or designee, the computer generates a report. The client receives a copy of the report containing the results of the analysis plus comments entered by the analyst where necessary. Copies of the reports and associated raw data are retained in secured archives.

Currently Lancaster Laboratories has over fifteen different reporting formats. Table A9-1 shows some of the formats available. Unless a specific report format is requested, the standard laboratory procedure is to report results to the limit of quantitation (LOQ) using report type 0 (see Table A9-1). However, it is possible to estimate to a value below the LOQ, if lower values are needed. Estimates are made to the reported method detection limit (MDL) which is based on annual MDL studies performed per method/matrix and instrument. An example analysis report is included in Appendix A.

The data packages are consistent with EPA CLP, NJDEP, and other state or agency formats. Custom formats are also accommodated. The data package types differ in the level of raw data and QC that would be submitted. Table A9-2 shows the formats offered and the information that can be included in a data package. Appendix A shows examples of the data package forms used for various types of methodology (i.e., GC/MS Volatiles, pesticides, etc.) The data packages are available as hard copy deliverables or a *.pdf* file on CDROM.

After the data package has been compiled, a content review and QA/QC compliance review on 100% of the data packages is performed by the Data Deliverable department or by other fully-trained staff. During the content review, the field chain of custody is compared to the reports to check the analysis performed, dates/times of collection, and sample designation. In addition to making sure data from all the appropriate departments is present, the following are also checked: method summary/reference, title page, table of contents, sample reference list, sample administration receipt documentation logs, and internal chains of custody (if required). In addition to making sure the data for all analyses are included, the following are also checked during the QA/QC compliance review: spot check results on the report against the raw data, ensure analyses performed within holding time, check quality control summary forms for compliance issues, and read the case narrative to make sure all nonconformances and anomalies are addressed.

In addition, the Quality Assurance Department reviews a representative sampling of the deliverables for completeness and to be sure that all batch quality control checks were performed and met specifications. This step includes review of holding times, calibrations, instrument tuning, blank results, duplicate results, matrix spike results, surrogate results, and laboratory control samples (where applicable). Every attempt to meet specifications will be made, and any item outside of the specifications will be noted in the case narrative. The laboratory will not validate data with regard to usability since this generally requires specific knowledge about the site.

Analytical results are delivered to the client in several electronic formats. LLI supports more than twelve industry-standard EDD formats and well over 100 custom EDD formats. The data for the EDD and hardcopy reports are retrieved directly from our LIMS. LLI offers data deliverables in many custom formats using a standard ASCII formatted structure (tab-delimited text; comma-delimited text; fixed length), structures for Microsoft Excel spreadsheets, and Microsoft Access database tables. In addition, LLI offers these industry standard EDD formats:

- EDF (California/COELT)
- Enovis
- Enviro Data (Geotech)
- EquIS, and its many variations, including:
  - Delaware "3DM"
  - EPA Region 2 "MEDD"
  - EPA Region 5 "ED MAN"
- ERPIMS (AFCEE)
- GIS/Key
- HazSite (HZRESULT table) for NJDEP
- Locus EIM
- TerraBase (Integrate)

We ensure the quality of our electronic data by providing 100 percent manual quality review of all data fields for new formats and a 10 percent review thereafter.

LLabWeb.com allows a client to access their verified analytical results round-the-clock through Lancaster Laboratories computer system using a secure Internet browser. Only analytical results on samples that are completed and verified can be accessed by this system.

A corporate procedure is in place for documentation, error correction, and control of logbooks (LOM-SOP-LAB-220, "Laboratory Notebooks, Logbooks, and Documentation"). The Office Services Group is responsible for maintaining the document and version control of the QA project plan and SOPs. All documents are assigned a revision number and date by the Office Services Group. They record all individuals or departments that have been issued a copy of a document and track that old versions are returned when the new one is issued. They are also responsible for maintaining the archive system to securely store records from all areas of the laboratory. LOM-SOP-LAB-203, "Data and Record Storage, Security, Retention, Archival, and Disposal" describes procedures for transferring data from the laboratories to the archives and maintaining the archives (including record retention schedule and disposal). The length of time for retention of hardcopy data is 10 years. All copies that are disposed of are incinerated. The Data Deliverables Group scans copies of the data packages onto CD-ROM for archiving. Electronic data files are saved and stored off-site for a minimum of 5 years.

Table A9-1
Data Reporting Formats

Report Format	Entered Result: Negative	Exactly Zero	MDL	LOQ	Above LOQ	Limit Shown on Report
0	<LOQ				Rounded Result	LOQ
1	N.D.		<LOQ		Rounded Result	LOQ
3	N.D.		Result with "J" Qualifier		Rounded Result	LOQ
4	N.D.		Result with "J" Qualifier		Rounded Result	MDL
10	N.D. if TMDL >MDL N.D. # if MDL >TMDL				Rounded Result	Greater of MDL or TMDL
12	MDL with "U" Qualifier		Result with "J" Qualifier		Rounded Result	MDL

Key:

MDL = Method Detection Limit
LOQ = Limit of Quantitation
BMQL = Below Minimum Quantitation Limit
TMDL = Target Method Detection Limit
J = Estimated Value
U = Client requested replacement for "<"

Table A9-2
Data Package Formats

Type I, NJ Regulatory (non-CLP)

- Title page
- Sample reference list
- Analysis request form, field chain of custody
- Sample administration receipt and documentation log
- Internal chain of custody (if required)
- Method summary/references
- Analysis reports/laboratory chronicles
- Case narrative
- Quality control summary; duplicates, matrix spike, matrix spike duplicate, blank, LCS, and surrogate recovery summary forms; GC/MS tuning summary and internal standard area summary
- Sample data; all raw sample data including instrument printouts and MDL summary form
- Standard Data; initial and continuing calibration summary forms, all raw initial and continuing calibrations and standardization data including instrument printouts
- Quality control raw data; all raw quality control sample data including printouts, preparation logs, run logs

Type II (non-CLP)

- Title page
- Sample reference list
- Analysis request form, field chain of custody
- Sample administration receipt and documentation log
- Internal chain of custody (if required)
- Method summary/reference
- Analysis reports/laboratory chronicles
- Case narrative
- Quality control summary; duplicate, matrix spike, matrix spike duplicate, blank, LCS, and surrogate recovery forms; GC/MS tuning, initial, and continuing calibration summary forms
- Sample data; all raw sample data including instrument printouts
- Quality control raw data; blank raw data, preparation logs

Type III, NJ Reduced Deliverables (non-CLP)

- Title page
- Sample reference list
- Analysis request form, field chain of custody
- Sample administration receipt and documentation log
- Internal chain of custody (if required)
- Method summary/reference
- Analysis reports/laboratory chronicles
- Case narrative and conformance/nonconformance summary
- Quality control summary; duplicate, matrix spike, matrix spike duplicate, blank, LCS, and surrogate recovery forms; GC/MS tuning summary and internal standard area summary; summaries for calibration and standardization
- Sample data; MDL summary form, all raw sample data including instrument printouts for GC, GC/MS, and TPH only (including calibration raw data)
- Quality control raw data; blank raw data for GC, GC/MS, and TPH only, preparation logs

Type IV, Full CLP Deliverables

- Title page
- Sample reference list
- Case narrative
- Analysis request form, field chain of custody
- Sample administration receipt and documentation log
- Internal chain of custody (if required)
- All CLP reporting forms; QC analytical results and calibration summaries
- Sample data; all raw data including instrument printouts
- Standard Data; all raw initial and continuing calibrations and standardization data including instrument printouts
- Quality control raw data; all raw quality control sample data including printouts, preparation logs, run logs

Table A9-2 – Continued
Data Package Formats

Type V, Reduced CLP Deliverables

- Title page
- Sample reference list
- Case narrative
- Analysis request form, field chain of custody
- Sample administration receipt and documentation log
- Internal chain of custody (if required)
- All CLP reporting forms; QC analytical results and calibration summaries
- Sample raw data; all raw sample data including instrument printouts for organics only
- Quality control raw data; blank raw data for organics only, preparation logs

Type VI, Raw Data Only

- Title page
- Sample data; all raw sample data including instrument printouts
- Quality control raw data; blank raw data, LCS raw data

GROUP B

MEASUREMENT/DATA ACQUISITION

B1. Sampling Process Design

In order for meaningful analytical data to be produced, the samples analyzed must be representative of the system from which they are drawn. It is the responsibility of the client to ensure that the samples are collected according to accepted or standard sampling methods. The client should evaluate the number, location, and type of samples to be collected. The appropriate number and frequency of field QC samples should also be determined by the client.

For non-standard matrices such as fish, worms, biota, large concrete or wood chunks, or other assorted waste, a discussion should take place with the laboratory to identify special handling requirements and confirm method performance for the particular matrix.

B2. Sampling Methods

The sampling methods should be selected by the client with regard to the intended application of the data.

The laboratory will provide the appropriate sample containers, required preservative, chain-of-custody forms, shipping containers, labels, and custody seals for the sampling. Trip blanks will be prepared by the laboratory and accompany sample containers at the project required frequency. Analyte free water will also be provided for field blanks. Temperature blanks will be included for monitoring cooler temperature upon receipt of the samples back at the laboratory. Pre-cleaned containers, with vendor supplied traceability documentation are available upon request. Because the laboratory does not stock this type of traceable container, 2 weeks prior notice is required.

Before use, each lot of preservative is documented and checked for contaminants. The appropriate bottle will be preserved with the new preservative and filled with deionized water to represent a sample. A similar container (that does not contain preservative) will be filled with deionized water to be used as a blank check. Analysis results are documented and reviewed for each preservative lot number.

A list of containers, preservatives, and holding times follows in Table B2-1.

Table B2-1
Sample Containers, Preservatives, and
Holding Times for Aqueous and Solid Samples

Fraction	Vol. Req. (mL) / Wt. Req. (g)	Container P=Plastic G=Glass	Preservation[a]	Holding Time[d] From Date of Collection Water	Soil
Volatiles	3 × 40 mL / 100 g[f]	G	Cool, 4°C[b] pH <2 w/ HCl	14 Days	14 Days
Pesticides	2 × 1000 mL / 100 g	G	Cool, 4°C[b]	7 Days to extraction[e]	14 Days to extraction[e]
Herbicides	2 × 1000 mL / 100 g	G	Cool, 4°C[b]	7 Days to extraction[e]	14 Days to extraction[e]
Halocarbons (Volatiles by GC)	3 × 40 mL / N/A	G	Cool, 4°C[b] pH <2 w/ HCl[c]	14 Days	N/A
Aromatics/Petroleum (Volatiles by GC)	3 × 40 mL / 100 g[f]	G	Cool, 4°C[b] pH <2 w/ HCl	14 Days	14 Days
Semivolatiles (Acid/Base Neutrals)	2 × 1000 mL / 100 g	G	Cool, 4°C[b]	7 Days to extraction[e]	14 Days to extraction[e]
PAHs (HPLC)	2 × 1000 mL / 100 g	G	Cool, 4°C $Na_2S_2O_3$	7 Days to extraction[e]	14 Days to extraction[e]
Metals	100 mL / 100 g	P,G	HNO_3 to pH <2	6 Months Hg 28 Days	6 Months Hg 28 Days
Cyanide	500 mL / 100 g	P,G	Cool, 4°C NaOH to pH >12 ascorbic acid	14 Days	14 Days
Sulfide	500 mL / 100 g	G	Cool, 4°C (NaOH, ZnAC Waters Only)	7 Days	7 Days
Phenol	1000 mL / 100 g	G	Cool, 4°C H_2SO_4 to pH <2	28 Days	28 Days
TPH	2 × 1000 mL / 100 g	G	Cool, 4°C pH <2 w/ HCl	7 Days	14 Days
Hexane Extractable Materials (HEM)	2 × 1000 mL / 100 g	G	Cool, 4°C pH <2 w/ HCl	28 Days	28 Days
TPH-GRO	3 × 40 mL / 100 g	G	Cool, 4°C pH <2 w/ HCl	7 Days	14 Days
TPH-DRO	2 × 1000 mL / 200 g	G	Cool, 4°C pH <2 w/ HCl	14 Days to extraction[e]	14 Days to extraction[e]
TOX	4 × 250 mL / 50 g	G	Cool, 4°C H_2SO_4 to pH <2 Na_2SO_3	28 Days	N/A
TOC	125 mL / 20 g	G	Cool, 4°C H_2SO_4 to pH <2	28 Days	28 Days
Total Nitrite/Nitrate	120 mL	P,G	Cool, 4°C H_2SO_4 to pH <2	28 Days[g]	N/A

[a]pH Adjustment with acid/base is performed on water samples only.

[b]Sodium thiosulfate needed for chlorinated water samples

[c]Due to the inaccurate recovery of 2-chloroethyl vinyl ether in the presence of HCl, Halocarbon samples analyzed for this compound should not be preserved.

[d]Samples will be analyzed as soon as possible after collection. The times listed are the maximum times that samples will be held before analysis and still be considered valid.

[e]Analysis 40 days from extraction.

[f]This is for soils not sampled by Method 5035 and 5035A. For these methods, see below.

[g]Holding time is 48 hours from time of collection for unpreserved samples.

NOTE: For volatiles analysis, the container should be filled completely, with no headspace. All sample containers, preservatives, and mailers will be supplied at no additional charge upon request, except for the special containers with traceability documentation. There is an additional charge for this type of container.

Soil Sampling for Volatile Organics by SW-846 5035 and 5035A

These are methods for collection and analysis of soils and solid waste samples for volatile organic compounds. Method 5035 is described in Update III to the Third Edition of SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, and is required for all analytical methods using purge and trap techniques (8021B, 8015B, and 8260B). Method 5035A is published by EPA on their website.

The volatile analysis is performed over two ranges:

	GC/MS (8260)	GC (8021 or 8015B)
Low Level	5 – 300 µg/kg	Not Available
High Level	>250 µg/kg	>20 µg/kg

The different levels require different sampling techniques. The low-level method can only handle samples within a specific concentration range (these samples CANNOT be diluted); therefore, a high-level sample MUST be collected to ensure that all the target analytes can be quantified.

Naturally occurring carbonates in some soils may cause effervescence (foaming) on contact with the sodium bisulfate ($NaHSO_4$) solution used as preservative for the low-level preparation. This interference makes it necessary for the laboratory to use the high-level prep or an alternative technique for low level.

Lancaster Laboratories supports the following options for the two levels:

Low-Level (LL) Options		No. of Containers*	Sample Size (g)	Holding Time†
1	LL EnCore	2	5	48 hours
	HL EnCore	1	5	48 hours
2	LL Field Preserved $NaHSO_4$	2	5	14 days
	HL Field Preserved Methanol	1	5	14 days
3	LL Empty VOA Vial	2	5	48 hours
	HL Methanol VOA Vial	1	5	14 days
4	LL Empty VOA Vial	2	5	48 hours
	HL Empty VOA Vial	1	5	48 hours
5	LL VOA Vial with Water	2	5	48 hours
	HL Methanol VOA Vial	1	5	14 days
High-Level (HL) Options		No. of Containers*	Sample Size (g)	Holding Time†
6	Field Preserved Methanol	1	10	14 days
7	Field Preserved Methanol	1	5	14 days
8	HL Encore	1	5	48 hours
9	HL Encore	1	25	48 hours

*Additional containers will be needed for MS/MSD.

†Because of the need to preserve the samples within 48 hours of collection, it is imperative that samples be returned to the laboratory within one day of sample collection. Once preserved the holding time is 14 days from collection. Although not recommended, samples can be submitted in bulk containers. The holding time for these samples is 14 days from collection.

If samples are collected in EnCore or other approved core samplers, a small quantity of soil must be collected for a moisture determination and to determine if the soil effervesces with the addition of sodium bisulfate. If the soils do react, they will be frozen until analysis in place of chemical preservation.

Options 1, 2, 6, 7, 8, and 9 follow EPA 5035. Options 3, 4, and 5 follow EPA method 5035A.

B3. Sampling Handling and Custody Requirements

Samples are unpacked and inspected in the sample receipt area. At this time, the samples are examined for breakage and agreement with the associated client paperwork. The cooler temperatures will be checked upon receipt and recorded. As the samples are unpacked, the sample label information will be compared to the chain-of-custody record and any discrepancies or missing information will be documented. If necessary, the cooler will be closed and placed in cold storage until instructions and resolution of any discrepancies are received from the client.

A member of our Sample Administration Group will act as sample custodian for the project. To ensure accountability of our results, a unique identification number is assigned to each sample as soon as possible after receipt at the laboratory. Upon entry into our LIMS and assignment of the seven digit sample number, labels are generated, along with an acknowledgement summarizing samples entered and the analyses scheduled. When samples requiring preservation by either acid or base are received at the laboratory, the pH will be measured and documented, with the exception of samples designated for volatile analysis, which are checked at the time of analysis. Samples requiring refrigeration will be stored at 2° to 4°C. The use of our computer system in tracking samples (by the Lancaster Labs sample number assignment) will control custody of the sample from receipt until the time of its disposal. The security system on our laboratory building allows us to designate the entire facility as a secure area since all exterior doors are either locked or attended. Therefore, hand-to-hand chain-of-custody is not part of our routine procedure, but is available upon request. If requested, hand-to-hand chain-of-custody will be provided as per attached LOM-SOP-ES-212, "Internal Chain-of-Custody Documentation." The laboratory chain-of-custody will begin with the preparation of bottles. The procedures for sample log-in, storage, and chain-of-custody documentation are detailed in the *EQPM* (see sections 5.2 and 5.3 in Figure B3-2) and the QA standard operating procedures included in Element B3 (LOM-SOP-ES-220, "Sample Storage and Discard" and LOM-SOP-ES-212, "Internal Chain-of-Custody Documentation"). Examples of sample labels and a custody seal are shown in Figure B3-1.

Figure B3-1

Sample Label (Field)

CLIENT

If you do not have an account with us, results will not be released until payment is received.

SAMPLE IDENTIFICATION / LOCATION CL RES:

COLLECTION INFORMATION:

☐ COMPOSITE
☐ GRAB

DATE TIME BY:

TESTING REQUIRED PRESERVATIVE(S) ADDED

Lancaster Laboratories
2425 New Holland Pike, Lancaster, PA 17601-5994

LL #

Sample Label (Laboratory)

TL 4258264 ASR-000 418 4/21/04
GRP-892948 EMP-0210

STANDARD FORM#: 2607
Results due 04/30/04 15:00
Group form #: 2607 Sample form #: 1722

00649-Lancaster Labs
14111
Batch# 04111-1457-8782 SPLP Volatile Blank
Extraction Fluid: DI H2O Vessel ID: 60
Tumble Batch Blank
01163 03636

Outgoing on Cooler or Kit (blue)

Lancaster Laboratories
Where quality is a science.

CUSTODY SEAL
2425 New Holland Pike, Lancaster, PA 17601-5994 (717) 656-2300

DATE:
SIGNATURE:

Incoming on Cooler Containing Samples (yellow)

Lancaster Laboratories
Where quality is a science.

137603
CUSTODY SEAL
2425 New Holland Pike, Lancaster, PA 17601-5994 (717) 656-2300

DATE:
SIGNATURE:

Figure B3-2

5.2. Sample Receipt and Entry

Samples can be received at the laboratory 24 hours a day, 7 days a week, 365 days of the year. Receipt can occur in one of three ways:

- Lancaster Laboratories courier services (i.e., Transportation Department)
- Personal delivery
- Commercial courier

All samples received for testing are delivered to the Sample Administration Department immediately upon arrival. This group is responsible for the unpacking and organizing of the samples. This process includes checking custody seals if present, paperwork agreement, signing the chain of custody, recording cooler temperatures, documenting the condition of containers, accounting for all sample bottles, observing any safety hazards, and reporting any problems to Client Services for communication to the client. This receipt process is documented.

As soon as practical after sample receipt, all samples are entered into our computerized sample management system (CSMS). Samples awaiting log-in are stored in temporary holding areas, at appropriate storage conditions to maintain sample integrity. If there is doubt about suitability of items received or if items do not conform to the description provided or the testing required is not clear or specified, the client will be contacted and the conversation documented.

At the time of entry, the CSMS will assign a unique Lancaster Laboratories' identification number to each sample. Upon entry of pertinent client information and assignment of a unique sample number, a label will print identifying each container, which is attached to the sample container.

Samples are tracked to the minute upon arrival. This will allow the client to see exactly how long it took the samples to pass through receipt, unpacking, and entry.

A sample acknowledgement will print from the CSMS per sample delivery group (SDG). This notification is sent to the client to confirm sample receipt and entry on the day following sample log-in. Internally, appropriate personnel will audit all applicable sample entry and client paperwork.

5.3. Sample Identification and Tracking

To ensure accountability of results, each sample is identified with a unique sequentially assigned number by the CSMS. In addition to the unique Lancaster Laboratories' sample number the following information will print on the label: client name, sample identification assigned by the client, sample collection information, storage area, bottle code ID, analyses requested, and any applicable notes to laboratory personnel.

This unique sample number is used to identify the sample in all laboratory data documentation, including notebooks, instrument printouts, and final reports. The sample number will also be used to identify additional containers of the sample that may be created during sample preparation and analysis (e.g., subsamples, extracts, digests).

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LABORATORY OPERATIONS MANUAL – ENVIRONMENTAL SCIENCES
Sample Storage and Discard

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Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

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Approvals

Prepared by: Barbara Frantz Reedy — Senior Specialist — Date: 10/24/03

Approved by: Michele M. Turner — Environmental Sciences Management — Date: 10/27/03

Approved by: Kathleen M. Lowrey — Quality Assurance — Date: 10/29/03

Revision Log:

Ver. #	Effective Date	Change
00	08/15/02	Previous Issue – SOP-QA-103.04
01	NOV 1 2 2003	Major changes are as follows: • Updated to LOM-SOP format. • Separated out Pharmaceutical references.

LOMSOPES220_01.DOC
102403

Reference:

Chemical Hygiene Plan, Lancaster Laboratories, current version.

Cross Reference:

The following procedures are cross-referenced in this document:

Document	Document Title
LOM-SOP-ES-212	Internal Chain-of-Custody Documentation
SOP-ES-001	Forensic Laboratory Services
SOP-QA-109	Laboratory Notebooks, Logbooks, and Documentation

Purpose:

Sample integrity can be compromised by improper storage conditions. The objective of this procedure is to prevent sample deterioration and mix-up prior to analysis. The laboratory information management system (LIMS) is used to assign storage locations to assist in the orderly storage of samples. Systems are also in place to ensure organized retrieval of samples for analysis and discard/return to client at an appropriate date.

Scope:

This procedure applies to Lancaster Laboratories Environmental Business units. The content of this procedure will describe general systems that are in place for sample storage, retrieval, return, and discard. Additional procedures within Sample Support describe the specific storage operations and requirements. Forensic storage is described in SOP-ES-001.

Safety Precautions:

Refer to the corporate *Chemical Hygiene Plan* which provides safety information. Contact your supervisor if you have questions or concerns about a sample.

Personnel Training and Qualifications:

Personnel who handle client samples must be familiar with the requirements of this procedure.

Procedure:

A. Sample storage and transfer

1. Sample Administration will gather information into the LIMS at the time of sample entry about the approximate size of samples to be received in a group and the type of storage they require (e.g., refrigerator, freezer, or room temperature).

2. The LIMS will assign the storage location and record the length of time the samples must be retained after the analysis report has been issued.

3. Samples will be stored in the assigned storage location, when not in the laboratory area.

4. In the event that a sample location change is needed due to a temperature adjustment, a sample custodian or sample administrator will access the appropriate LIMS program and choose a new location. After a successful change in location has occurred, the new location will be written on each Lancaster Laboratories sample label, or a new label will be reprinted and adhered to the sample. The sample will then be transferred to the new storage location.

5. Analysts requiring the use of a sample may determine its location by referring to a departmental sample status sheet, LIMS, or SA entry paperwork.

6. To prevent unnecessary deterioration of the samples, the contents needed for analysis shall be removed and the sample returned to storage with a minimum of delay.

B. Security of storage areas

There are varying degrees of additional security requirements for storage areas, which are in addition to the building security. This additional security may be driven by various regulatory agencies or client requirements. The following are different levels of security which are in place at the laboratory.

1. Samples are stored in a controlled access area and are tracked by an automated sample retrieval storage system (ASRS). Samples are barcoded in and out of this system to track retrieval, return, and disposal.

2. Forensic storage areas are locked and admission to these areas is permitted only to sample custodians. See SOP-ES-001 for further details on forensic storage. Most of the samples stored in these areas require chain-of-custody documentation as outlined in LOM-SOP-ES-212. Samples may not be removed from this area without signing a chain-of-custody form. A chain-of-custody record may also be kept for samples, at the request of the client, even if the samples are not for forensic purposes.

C. Sample discard

1. When the retention time for sample storage has expired, a discard list will be generated from the LIMS. The retention dates are based upon client requirements or defaulted to a given number of days past the date when the final analysis report is generated, if no client requirement is given.

2. These samples will be removed from their assigned storage area by a sample custodian or analyst, and either disposed of or returned to the client.

3. Hazardous samples shall either be returned to clients, decontaminated, or disposed of by personnel trained in hazardous waste discard assessment or health and safety personnel.

D. Storage conditions

1. The temperature of each sample storage location requiring a temperature control is continuously monitored by the Andover system or it is checked during each normal working day by an assigned person responsible for the sample storage area. This information shall be recorded. Temperature monitoring documentation shall be recorded in ink and changes shall be made in accordance with the error correction procedure outlined in SOP-QA-109.

2. The following temperature ranges need to be maintained within storage units, unless otherwise specified.

Refrigerator Storage	Freezer Storage	Room Temperature
2° to 4°C	-10° to -20°C	NA

NOTE: Storage conditions of -40° ± 10°C and -80° ± 10°C are also available.

3. If the temperature recorded does not fall within these ranges, corrective action must be taken and documented as per policy.

4. Temperature records must be reviewed by a second qualified person and this information must be permanently archived.

5. In the event that additional storage areas are needed as "overflow" storage, systems must be put into place before samples can be stored. These areas must also be monitored for acceptable storage conditions.

6. If a client requests storage conditions which are outside the temperature ranges defined above, arrangements will be made to accommodate the request, if possible.

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LABORATORY OPERATIONS MANUAL – ENVIROMENTAL SCIENCES SECTION
Internal Chain-of-Custody Documentation

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Approvals

Prepared by: Dorothy M Love — QA Senior Specialist/Coordinator — Date: 2/5/03

Approved by: Kathleen M. Lowery — Quality Assurance Management — Date: 2/5/03

Approved by: [signature] — Executive Management — Date: 2/6/03

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

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01	FEB 2 0 2003	Major changes are as follows: • Removed Pharmaceutical information • Updated to LOM-SOP format • Minor clarifications throughout • Updated Figure 3 and 5

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020403

Cross Reference:

The following procedures/forms are cross-referenced in this document:

Document	Document Title
SOP-QA-102	Sample Log-In
SOP-QA-109	Laboratory Notebooks, Logbooks and Documentation
Form 2016	Secure Storage Chain of Custody Original Sample
Form 2102	Analysis Request/Environmental Service Chain of Custody
Form 2174	Sample Administration Receipt Documentation Log
Form 2231	Secure Storage Chain of Custody, Metals
Form 2365	Master List of Chains of Custody
Form 2667	Sample Storage, Off-Shift Entry Logbook

Purpose:

In order to demonstrate reliability of data which may be used as evidence in a legal case, required by a regulatory agency, or required by a client, an accurate written record tracing the possession of samples must be maintained from the time they are received at the laboratory until the last requested analysis is verified. The purpose of a chain of custody (COC) is to ensure traceability of samples while they are in the possession of the laboratory.

Scope:

This procedure describes the initiating and maintaining of COC documentation for samples that require this level of traceability. It applies to the Environmental Division of Lancaster Laboratories when a client or regulatory agency requests an accurate written record tracing the possession of samples from the time they are received at the laboratory until the last requested analysis is verified. This procedure also applies to samples that may be used as evidence in a legal case.

Definitions:

A sample is in custody if it is in any one of the following states:

1. In actual physical possession
2. In view after being in physical possession.
3. Locked up so no one can tamper with it.
4. In a secured area, restricted to authorized personnel (e.g., in the ASRS).

Personnel Training and Qualifications:

Training for this procedure consists of reading this SOP. Supervisory review of all COC documentation should be done until the trainer is satisfied that proficiency has been achieved. Training of all laboratory personnel is the responsibility of the group leader. Documentation that this training has been completed must be kept in the employee's training record.

Procedure:

A. Initial documentation

1. Chain-of-custody documentation shall be kept upon the request of the client or for any samples that are known to be involved in a legal dispute. As with all analytical data, it is extremely important that this documentation is filled out completely and accurately with every sample transfer. Everyone who handles the COC is responsible to check for documentation compliance to the point of their acquisition. If changes need to be made to the form, they shall be made in accordance to the error correction procedure addressed in SOP-QA-109. It is the responsibility of the person who made an error in documentation to correct the error.

2. If requested by the client, the COC documentation will begin with the preparation of sampling containers. Form 2102 (Figure 1) will be initiated by the person packing the bottle order for shipment to the client. If the delivery of containers is via Lancaster Laboratories Transportation department, the driver shall sign the form when they relinquish the bottles to the client. Drivers must also sign COC forms when they pick up samples from a client for transportation to the laboratory.

3. When samples arrive at the laboratory for analysis, a member of the Sample Administration group will receive them and sign the external COC form that accompanies the samples, if provided. If the samples were picked up by our Transportation department, the driver must sign the COC to relinquish the samples to Sample Administration.

4. The Sample Administration group will track the custody of samples between receipt and entry into the CSMS on Form 2174 (Figure 2). The client's sample designation will be used for identification purposes until a unique Lancaster Laboratories number is assigned.

5. Samples will be entered into the Sample Management System as described in SOP-QA-102. Sample Administration will enter an analysis number for "Laboratory Chain of Custody" if requested. A lab note will print to inform analysts of the need for COC documentation. This note will also be automatically added to the sample labels.

B. Creating the internal COC

1. Sample Administration personnel shall initiate an internal Laboratory Chain of Custody Form 2016 (Figure 3) at the time of sample entry for each type of container in the sample group. Form 2365 will be initiated for each sample group at the time of entry (Figure 4). The samples will then be relinquished to a sample custodian who will store the samples in an assigned secure location. This change of custody from sample entry to storage shall be documented on the chain, as well as any interim exchanges for rush analysis, preservation, homogenization, or temporary storage in the SA HOLD. The internal COC forms will then accompany the samples from storage to the laboratory for analysis.

2. If samples need to be checked out from the Sample Administration group, for rush or short hold time analyses, before Lancaster Laboratories numbers have been assigned to them, SA is responsible for starting a COC form. They will note the available header information, the samples being relinquished (documented by the client sample designation), and the reason for transfer.

3. After sample entry, the original copy of the external client COC/analysis request form will be filed with Accounts Receivable, to be returned to the client with their invoice. Other copies of the external form will stay within SA to be filed within the client's paperwork file.

C. Documentation of custody changes

1. An example of how to document changes in sample custody is shown in Figures 3 and 5. Each change of sample custody must be accurately documented in a consistent format. All signatures documenting changes of custody will use the following format:

   Signatures: First initial, full last name, employee number
   Date: Month/day/year
   Time: Documented as military time
   Ink: Black ink is preferred, red ink and pencil are not acceptable

   a. When Sample Support releases samples to an analyst they must:

      Note the sample number(s) released and sign the "Released By" column of the chain.

   b. When an analyst receives samples from Sample Support they must:

      Sign the "Received By" column, note the date and time samples are received, and note the reason why they are taking the samples (reason for change of custody).

   c. When an analyst returns samples to Sample Support they must:

Note all sample numbers being returned, sign the Released By column, and note time and date of return.

d. When Sample Support receives samples from an analyst they must:

Sign the Received By column and note the reason for sample transfer.

2. Sample handling should be kept to a minimum. Analysts requiring use of a sample will requisition it through the computer requisition program. During the hours when Sample Support is staffed by sample custodians, a custodian will receive the computerized requisition and remove the sample from storage. The custodian will ensure that the bottle type listed on the COC form matches the bottle type being distributed. It is the shared responsibility of the analyst and sample custodian to ensure that forms are signed, dated, and that the reason for sample transfer are recorded with each change of custody, as directed by item (3) a. above.

3. Each specific test that an analyst performed in conjunction with the associated sample number(s) must be accurately documented by the analyst before the samples are returned to a sample custodian in the sample storage area.

4. When an analyst requires the use of samples when a sample custodian is not on duty, they must requisition samples earlier in the day or on the previous day. These samples and associated COCs will be pulled by a sample custodian and placed in the locked Main Storage area. The sample custodian will note on the COC the change in transfer to the Main Storage in addition to the time, date, and the sample numbers. When an analyst picks up the sample from Main Storage, they will need to contact the security person on duty to unlock the Main Storage unit. The analyst will need to fill out Form 2667 (Figure 6) which will be located by the entrance to the Main Storage unit to document entry into the storage unit (security will co-sign as a witness). Once the notebook is signed, the analyst may enter and retrieve their samples. The analyst picking up the samples will document the specific samples being checked out. The security person will sign in the Released By column. The analyst will sign the Received By column, note the time, date, and reason for transfer. When the analyst returns the samples to the Main Storage, security must be contacted. The logbook must be signed by the analyst and security, the analyst must sign the Released By column, and security must sign the Received By column indicating the time, date, and reason for transfer (e.g., Main Storage).

5. The following changes of custody will be handled as noted below:

a. Documentation is required for all shift changes. Signatures involving transfers from one shift to another shall be the responsibility of the analyst who originally acquired the samples from Sample Support.

b. Occasionally, a sample container will be needed for analysis by an analyst in a department while it is in the custody of an analyst in another department. It will be the responsibility of the first person who received the sample to note on the COC the specific sample numbers requested by the second person and to sign

the Released By column. The second person will sign the Received By column and note the time, date, and reason for sample transfer. After the second person is finished with the sample, the sample will be returned back to the first person or to the Sample Storage area.

c. In situations where a sample group must be split between departments working on different analyses, a supplemental COC must be initiated by the Sample Support Group. The supplemental chain will be used to accompany that portion of the sample group that is needed by a second department, when another department has part of the sample group and the COC for the entire group. This supplemental COC will be created only when absolutely necessary to minimize paperwork and confusion. This chain must also be documented on the master list of chains initiated for the sample group.

d. If COC samples are stored in other areas of the laboratory or in a specific department, they must be stored in a secured area. When samples are taken from a departmental storage area, the Released By column of the COC is documented as "department XX storage." If samples are returned to this area when complete, the Received By column will be noted as department XX storage.

D. Additional COC issues

1. Analysts in possession of samples shall remove the aliquot required for their analysis and return the samples to the Sample Support Group with a minimum of delay. During this time of possession, samples must fall under the definition of sample custody.

2. If additional containers of the sample are created (e.g., subsamples, extracts, distillates, leachates, digests, etc.), then additional COC form must be created by the department if they do not document this information on the original COC form. This form will be marked with the container type and will be initiated to accompany the new sample container. Each department in the lab has specifically designed COC forms that will be used if new containers are created, (see Figure 5 for an example). All changes of custody involving handling of new containers in the department (e.g., analysis, storage, vials on instruments, etc.) will be documented on the departmental specific COC form or on the original COC form. Any specific handling or documentation requirements for departmental chains can be described in a departmental SOP.

E. Completion of the process

1. After sample analysis, samples shall be returned to the Sample Support Group as soon as possible. Original COC forms shall also be returned with the samples and this change of custody noted. At this time, it is the responsibility of the Sample Support Group to review the COC forms to ensure that all documentation on the forms is complete before they file the forms in their area. Sample custodians will not return a sample to its assigned storage location without signing the accompanying chain and performing this completeness check. All chains should either end with a note of "All Sample Consumed," "Discard," or "Storage" for the final reason of transfer.

2. All completed COC forms for the original sample containers will be retained in files within Sample Support. The Data Deliverables Group will retrieve these forms so a copy can be included in the data package. (**NOTE:** For those employees who collect COC forms for data packages; if you find a completed COC form in your area that does not get a data package, please send that COC form to the project manager for that account. The project manager will determine whether copies of the COCs get sent to the client with the reports or whether the originals will be archived at Lancaster Laboratories. The project manager will then forward the original COC forms to the Data Deliverables Department for archiving). All departmental created COC forms are collected by the department's data package group so that a copy can be included in the data package. These forms will not be returned to the Sample Support Group since these sample containers will not be returned to the Sample Support Group. The original copy of all COC forms will be retained on file by the laboratory.

3. All personnel who handle sample containers shall make every attempt to ensure that all changes of custody are accurately and completely documented. Disciplinary action may be taken for employees who fail to comply with these important requirements.

4. In the event that a signature or other information is inadvertently not recorded on a COC form, then Sample Support, Data Package Groups, in conjunction with the technical groups, shall determine what information is missing. This can be performed by checking computer requisition records, raw data, or the Sample Support work schedule. The responsible party shall add the missing information or make the necessary correction at the bottom of the COC form, in addition to noting the situation that caused the error in documentation. The person making this note needs to sign and date the information using the current date. Any errors in COC documentation that cause noncompliances must be noted in the case narrative of the sample data package. Examples of specific cases are on file in the Data Package Department.

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Figure 1

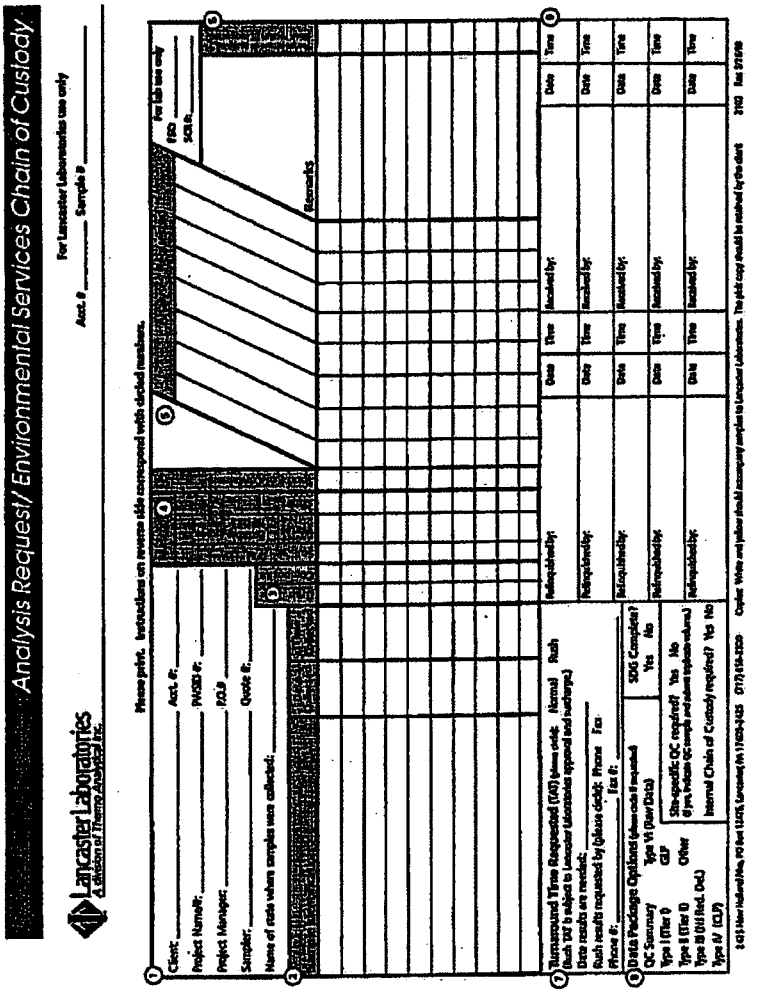
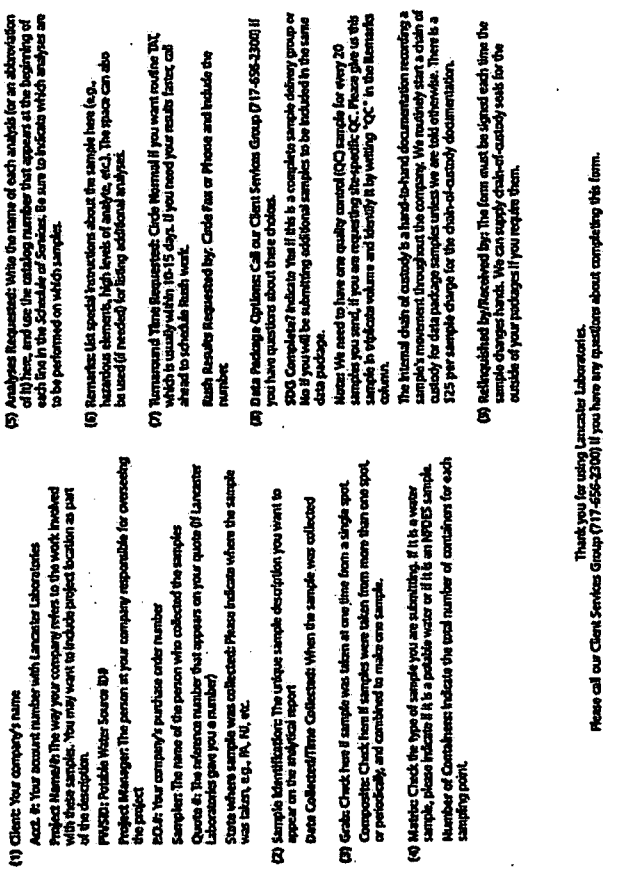


Figure 1 – Continued



DIRECTIONS FOR COMPLETING THIS FORM

(1) Client: Your company's name
Acct. #: Your account number with Lancaster Laboratories
Project Name/#: The way your company refers to the work involved with these samples. You may want to include project location as part of the description.
PWSID: Potable Water Source ID#
Project Manager: The person at your company responsible for overseeing the project
P.O.#: Your company's purchase order number
Sampler: The name of the person who collected the samples
Quote #: The reference number that appears on your quote (if Lancaster Laboratories gave you a number)
State where sample was collected: Please indicate where the sample was taken, e.g., PA, NJ, etc.

(2) Sample Identification: The unique sample description you want to appear on the analytical report
Date Collected/Time Collected: When the sample was collected

(3) Grab: Check here if sample was taken at one time from a single spot.
Composite: Check here if samples were taken from more than one spot, or periodically, and combined to make one sample.

(4) Matrix: Check the type of sample you are submitting. If it is a water sample, please indicate if it is a potable water or if it is an NPDES sample.
Number of Containers: Indicate the total number of containers for each sampling point.

(5) Analyses Requested: Write the name of each analysis (or an abbreviation of it) here, and use the catalog number that appears at the beginning of each line in the *Schedule of Services*. Be sure to indicate which analyses are to be performed on which samples.

(6) Remarks: List special instructions about the sample here (e.g., hazardous elements, high levels of analyte, etc.). The space can also be used (if needed) for listing additional analytes.

(7) Turnaround Time Requested: Circle Normal if you want routine TAT, which is usually within 10-15 days. If you need your results faster, call ahead to schedule Rush work.
Rush: Results Requested by: Circle Fax or Phone and include the number.

(8) Data Package Options: Call our Client Services Group (717-656-2300) if you have questions about these choices.
SDG Complete? Indicate Yes if this is a complete sample delivery group or No if you will be submitting additional samples to be included in the same data package.
Notes: We need to have one quality control (QC) sample for every 20 samples you send. If you are requesting site-specific QC, Please give us this sample in triplicate volume and identify it by writing "QC" in the Remarks column.
The internal chain of custody is a hand-to-hand documentation recording a sample's movement throughout the company. We routinely start a chain of custody for data package samples unless we are told otherwise. There is a $25 per sample charge for the chain-of-custody documentation.

(9) Relinquished by/Received by: The form must be signed each time the sample changes hands. We can supply chain-of-custody seals for the outside of your packages if you require them.

Thank you for using Lancaster Laboratories.
Please call our Client Services Group (717-656-2300) if you have any questions about completing this form.

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Figure 2

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Sample Administration
Receipt Documentation Log

Client/Project: _____
Date of Receipt: _____
Time of Receipt: _____
Source Code: _____

Shipping Container Sealed: Y / N
COC Seal Present: Y / N
COC Seal Intact: Y / N
Package: Chilled / Not Chilled
Unpacker Emp. No.: _____

Temperature of Shipping Containers	
#1	#2
Thermometer ID: _____ Temp.: _____ Temp. Bottle / Surface Temp. Wet Ice / Dry Ice / Ice Packs Ice Present? Y / N Loose / Bagged	Thermometer ID: _____ Temp.: _____ Temp. Bottle / Surface Temp. Wet Ice / Dry Ice / Ice Packs Ice Present? Y / N Loose / Bagged
#3	#4
Thermometer ID: _____ Temp.: _____ Temp. Bottle / Surface Temp. Wet Ice / Dry Ice / Ice Packs Ice Present? Y / N Loose / Bagged	Thermometer ID: _____ Temp.: _____ Temp. Bottle / Surface Temp. Wet Ice / Dry Ice / Ice Packs Ice Present? Y / N Loose / Bagged

Paperwork Discrepancy/Unpacking Problems: _____

Sample Administration Internal Chain of Custody			
Name	Date	Time	Reason for Transfer
			Unpacking
			Place in Storage or Entry
			Remove from Storage
			Place in Storage or Entry
			Entry

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Figure 3

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Secure Storage Chain of Custody
Original Sample

Client/Project: ABC Corporation

Preservative: none Matrix: water SDG: ABC01

Sample # Range of Entry Group: 1234567-70 Bottle Type: 05

Sample Number(s) in Custody	Released By	Received By	Date of Transfer	Time of Transfer	Reason for Change of Custody	Dist., Extr., or Digest Chain Created (X)
1234567, 69	I. Keepit 123	M. Chemist 456	2/3/03	0830	BOD analysis	
1234567, 69	M. Chemist 456	I. Keepit 123	2/3/03	1015	storage	X

2018.01

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LOM-SOP-ES-212.01
Supersedes Date: None
Effective Date: FEB 2 0 2003
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Figure 4

Lancaster Laboratories **Master List of Chain of Custodies**

Client/Project: _____

Sample # Range of Entry Group: _____

SDG: _____ Matrix: Liquid Solid Mixed Other _____

Original Sample Chains		
Bottle Type	Started By	Date Started

Supplemental Chains		
Bottle Type	Started By	Date Started

Extraction, Digestion, Distillates, Etc.		
Bottle Type	Started By	Date Started

2365 10/10/95

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Figure 5

Secure Storage Chain of Custody
Metals

Client/Project: ABC Corporation

Sample #: 1234568, 70 SDG: ABC01

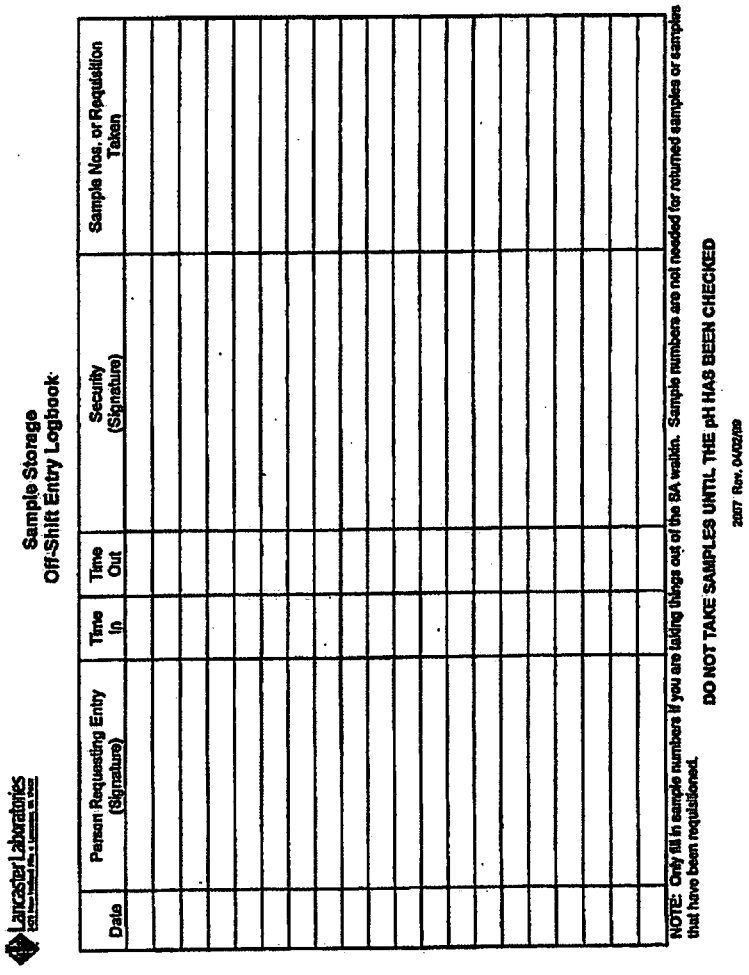
Digest Type (circle one): (Hg) Metals GF Hydrides Trial No: _____ (if not 1, fill in)

Batch No: 0 2 3 4 5 | 5 7 1 3 | 0 0 1

Sample Number(s) in Custody	Released By	Received By	Date of Transfer	Time of Transfer	Reason for Change of Custody
1234568, 70	T. Freeman 731	dept 22 storage	2/4/03	1430	digest storage
1234568, 70	dept 22 storage	B.K. Hess 1049	2/5/03	1600	analysis
1234568, 70	B.K. Hess 1049	J. Wurstate 332	2/6/03	1700	shift change
1234568, 70	J. Wurstate 332	dept 22 storage	2/6/03	2300	storage
1234568, 70	dept 22 storage	K. Dean 392	2/10/03	1100	digest disposal

2231 Rev. 04/15/98

Figure 6



Lancaster Laboratories

Sample Storage
Off-Shift Entry Logbook

Date	Person Requesting Entry (Signature)	Time In	Time Out	Security (Signature)	Sample Nos. or Regulation Taken

NOTE: Only fill in sample numbers if you are taking things out of the SA walkin. Sample numbers are not needed for returned samples or samples that have been requisitioned.

DO NOT TAKE SAMPLES UNTIL THE pH HAS BEEN CHECKED

2007 Rev. 04/02/09

B4. Analytical Methods Requirements

The analytical procedures to be used for organics and inorganics are those described in the *USEPA SW-846 3rd Edition, Update III, 1996,* and *Methods for the Chemical Analysis of Waters and Wastes, USEPA, 600/4-79-020* for the preparation and analysis of water, sediment, and soil for the client specified compounds. Copies of the analytical procedures are located in the laboratory and available for use by analysts. Copies of analytical methods are available upon request. Quantitation and detection limits for the following methods are noted in Tables B4-2 through B4-25. These are evaluated annually and are subject to change, as per the guidelines given in 40 CFR Part 136 Appendix B.

Inorganic Analysis

Metals by Inductively Coupled Plasma (ICP) – This is a technique for the simultaneous determination of elements in solution after acid digestion. The basis of the method is the measurement of atomic emission by an optical spectroscopic technique. Characteristic atomic line emission spectra are produced by excitation of the sample in a radio frequency inductively coupled plasma. Method 6010B, See Table B4-1 for list of elements and prep methods.

Metals by Graphite Furnace Atomic Absorption (GFAA) – This is a method of analysis designed to detect trace amounts of the analyte through electrothermal atomization. Samples are digested before analysis. The graphite furnace AA spectrophotometer heats the sample within a graphite tube using an electrical current (i.e. flameless furnace) and measures the absorption of specific metallic elements at discrete wavelengths. Methods listed in Table B4-1.

Mercury by Cold Vapor Atomic Absorption – Organic mercury compounds are oxidized and the mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of a spectrophotometer and absorbance (peak height) is measured. Method 7470A/7471A.

Metals by Inductively Coupled Plasma Mass Spectrometer (ICP/MS) – This is a technique for the simultaneous determination of elements in solution after acid digestion. The method involves the breakdown of molecules into elemental ions in a plasma followed by a mass spectometric measurement. Characteristic mass spectra are produced by the element's natural isotopes. Method 6020.
See Table B4-1 for list of elements and prep methods.

Micellaneous Wet Chemistry

Moisture – A known sample weight is placed in a drying oven maintained at 103° to 105°C for 8 to 24 hours. The sample is reweighed after drying and this value is divided by the original weight. The result is used to calculate analytical concentration on a dry-weight basis. Method 160.3 (modified).

Cyanide, total – Distillation of the sample releases the cyanide from cyanide complexes as HCN. The liberated HCN and simple cyanides are converted to cyanogen chloride by reaction with chloramine T. This reacts with pyridine and barbituric acid reagent to give a red colored complex. The absorbance is read at 570 nm and is compared to a standard curve using an automated spectrophotometer. Method 9012A.

Phenolics, total – This method is based on automated distillation of phenol and the subsequent reaction with 4-aminoantipyrine in basic buffer to produce a red colored complex. The absorbance is read at 505 nm and is compared to a standard curve using an autotomated spectrophotometer. Method 9066.

Sulfide, total – The sample is acidified and a known excess of iodine is added. The iodine reacts with sulfide in acid solution, oxidizing sulfide to sulfur. The excess iodine is back-titrated with sodium thiosulfate. Method 9034 (modified).

Total Petroleum Hydrocarbons – Samples are extracted with freon and the resulting solution is treated with silica gel to remove fatty acids and other polar compounds. The remaining nonpolar compounds are designated as petroleum hydrocarbons and are quantitatively measured using Fourier Transform Infrared Spectroscopy (FTIR), Method 418.1 (modified for soils).

Hexane Extractable Materials (HEM) – For HEM a one liter sample is serially extracted with *n*-hexane in a separatory funnel. The solvent is evaporated from the extract, and the residual HEM is weighed. For SGT-HEM a one liter sample is serially extracted with *n*-hexane in a separatory funnel. The extract is mixed with silica gel, filtered through sodium sulfate, the solvent evaporated from the extract, and the residual SGT-HEM is weighed. Method 1664A.

Total Organic Carbon (TOC) – Following acidification, the sample is purged with nitrogen to remove inorganic carbon. Persulfate is injected to oxidize organic carbon to carbon dioxide which is detected by IR. Method 9060.

Total Organic Halogen (TOX) – Organic halogen is adsorbed onto an activated carbon column and combusted in an oxygen furnace. The resulting hydrogen halide gases are collected in an acetic acid buffer. The halides are titrated microcoulometrically through the generation of Ag+ ions. Method 9020B.

Total Nitrite/Nitrate – Using an autoanalyzer, the sample is passed through a column containing granulated copper-cadmium to reduce nitrate to nitrite. The nitrite ion reacts with sulfanilamide to yield a diazo compound which couples with *n*-1-naphylethylenediamine dihydrochloride to form a soluble, highly colored dye. The absorbance is read at 520 nm and compared to a standard curve. Method 353.2.

Organic Analysis

Volatiles by GC/MS – This method determines the concentration of volatile (purgeable) organics. The analysis is based on purging the volatiles onto a Tenax/silica gel trap, desorbing the volatiles onto a gas chromatographic column which separates them and identifying the separated components with a mass spectrometer. Method 8260B/5030B/5035.

Semivolatiles by GC/MS – This method determines the concentration of semivolatile organic compounds that are separated into an organic solvent and are amenable to gas chromatography. The method involves solvent extraction of the sample to isolate analytes and GC/MS analysis to determine semivolatile compounds present in the sample. Method 8270C/3550B/3510C.

Volatiles by GC – This method determines the concentration of volatile (purgeable) organic compounds. The analysis is based on purging the volatiles from the sample onto an appropriate sorbent trap and desorbing the volatiles onto a gas chromatographic column. Using an appropriate temperature program, the compounds are separated by the column and both qualitative and quantitative detection is achieved with a photoionization and/or electrolytic conductivity detector. Method 8021B/5030B/5035. Non-halogenated organics are analyzed by flame ionization detectors. Method 8015B/5030B/5035.

TPH-GRO – This method determines the concentration of gasoline range organics (2-methylpentane to 1,2,4-trimethylbenzene). The analysis is based on purging the volatiles from the sample onto an appropriate sorbent trap and desorbing the volatiles onto a gas chromatographic column. Using an appropriate temperature program, the compounds are separated by the column and both qualitative and quantitative detection is achieved with a flame ionization detector. BTEX may be determined simultaneously on systems equipped with a photoionization detector in tandem with the FID. Method 8015B/5030B/5035.

TPH-DRO – This method determines the concentration of diesel range organics (C-10 to C-28 hydrocarbons). The procedure includes solvent extraction of the sample and analysis of the extract on a gas chromatograph/flame ionization detector (GC/FID) using a megabore capillary column. Method API "Method for Determination of Diesel Range Organics," Revision 2, 02/05/95; or California Department of Health Services LUFT Task Force TPH Analysis-Diesel Method, 10/18/89, Method 8015B/5030B/5035.

Pesticides, PCBs, and Herbicides – These methods determine the concentration of organochloride pesticides, polychlorinated biphenyls, herbicides, and organophosphate pesticides. The procedures include solvent extraction of the sample, analysis of the extract on a gas chromatograph/electron capture detector (GC/EC) using a capillary column, and confirmation on a GC/EC using a second capillary column. A nitrogen-phosphorus detector is used for organophosphates. If the compound concentration is sufficient, confirmation may be performed on GC/MS upon request. Pesticides methods 8081A/3550B/3510C and 8141A/3550B/3510C. PCBs Method 8082/3550B/3510C. Herbicides Method 8151A/3550B.

PAHs by HPLC – The sample aliquot is extracted with methylene chloride. The extract is filtered (soils), dried, concentrated by evaporation and exchanged into acetonitrile. The extract is analyzed by reverse-phase HPLC with both UV and fluorescence detectors. Methods 8310/3550B/3510C.

Table B4-1
Inorganic Analytical Method Numbers

	ICP	GFAA	ICP/MS
Aluminum	6010B/3005A/3010/3050B		6020/3010MOD/3050B
Antimony	6010B/3005A/3010/3050B	7041/3005A/3050B	6020/3010MOD/3050B
Arsenic	6010B/3005A/3010/3050B	7060A	6020/3010MOD/3050B
Barium	6010B/3005A/3010/3050B		6020/3010MOD/3050B
Beryllium	6010B/3005A/3010/3050B	7091/3020A/3050B	6020/3010MOD/3050B
Cadmium	6010B/3005A/3010/3050B	7131A/3020A/3050B	6020/3010MOD/3050B
Calcium	6010B/3005A/3010/3050B		6020/3010MOD/3050B
Chromium	6010B/3005A/3010/3050B	7191/3020A/3050B	6020/3010MOD/3050B
Cobalt	6010B/3005A/3010/3050B		6020/3010MOD/3050B
Copper	6010B/3005A/3010/3050B	7211/3020A/3050B	6020/3010MOD/3050B
Iron	6010B/3005A/3010/3050B		6020/3010MOD/3050B
Lead	6010B/3005A/3010/3050B	7421/3020A/3050B	6020/3010MOD/3050B
Magnesium	6010B/3005A/3010/3050B		6020/3010MOD/3050B
Manganese	6010B/3005A/3010/3050B		6020/3010MOD/3050B
Molybdenum	6010B/3005A/3010/3050B		6020/3010MOD/3050B
Nickel	6010B/3005A/3010/3050B	7521/3020A/3050B	6020/3010MOD/3050B
Potassium	6010B/3005A/3010/3050B		6020/3010MOD/3050B
Selenium	6010B/3005A/3010/3050B	7740	6020/3010MOD/3050B
Silver	6010B/3005A/3010/3050B	7761/3020A/3050B	6020/3010MOD/3050B
Sodium	6010B/3005A/3010/3050B		6020/3010MOD/3050B
Thallium	6010B/3005A/3010/3050B	7841/3020A/3050B	6020/3010MOD/3050B
Tin	6010B/3005A/3010/3050B		6020/3010MOD/3050B
Vanadium	6010B/3005A/3010/3050B		6020/3010MOD/3050B
Zinc	6010B/3005A/3010/3050B		6020/3010MOD/3050B

The number of parameters analyzed and the method used will be determined by the site-specific requirements.

Mercury by Cold Vapor – 7470A/7471A.

Table B4-2
Metals Compound List (TAL)

Analyte	Waters		Soils**	
	LOQ* (mg/L)	MDL (mg/L)	LOQ* (mg/kg)	MDL (mg/kg)
Aluminum	0.2	0.041	20	2.96
Antimony[1]	0.02	0.0085	2.	0.66
Arsenic[1]	0.01	0.0049	1.	0.5
Barium[1]	0.005	0.00042	0.5	0.032
Beryllium[1]	0.005	0.00034	0.5	0.059
Cadmium[1]	0.005	0.00087	0.5	0.054
Calcium	0.2	0.049	20	1.25
Chromium[1]	0.005	0.0022	0.5	0.2
Cobalt[1]	0.005	0.0016	0.5	0.14
Copper[1]	0.01	0.0021	1.	0.19
Iron[1]	0.2	0.045	20	4.89
Lead[3]	0.003	0.0012	1.	0.08
Magnesium	0.1	0.018	10	1.98
Manganese[1]	0.005	0.00051	0.5	0.038
Mercury[2]	0.0002	0.00016	0.1	0.0028
Nickel[1]	0.01	0.0038	1.	0.2
Potassium	0.5	0.043	50	3.72
Selenium[1]	0.01	0.0047	1.	0.47
Silver[1]	0.005	0.0018	0.5	0.15
Sodium	1.	0.46	100	47.2
Thallium[3]	0.01	0.0074	2.	0.16
Vanadium[1]	0.005	0.0017	0.5	0.16
Zinc[1]	0.005	0.0041	2.	0.18
Cyanide, total[4]	0.005	0.01	0.18	0.5

[1]Analyzed by Trace ICP

[2]Analyzed by Cold Vapor

[3]Analyzed by GFAA

[4]Analyzed by automated spectrophotometer

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis, will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQs and MDLs are evaluated annually and subject to change.

Table B4-3
Inorganic Priority Pollutants List

Analyte	Waters		Soils***	
	LOQ** (mg/L)	MDL (mg/L)	LOQ** (mg/kg)	MDL (mg/kg)
Antimony	0.02	0.0085	2.	0.66
Arsenic	0.01	0.0049	1.	0.5
Beryllium	0.005	0.00034	0.5	0.059
Cadmium	0.005	0.00087	0.5	0.054
Chromium	0.005	0.0022	0.5	0.2
Copper	0.01	0.0021	1.	0.19
Lead	0.02	0.0093	2.	0.79
Mercury*	0.0002	0.00016	0.1	0.0028
Nickel	0.01	0.0038	1.	0.2
Selenium	0.01	0.0047	1.	0.47
Silver	0.005	0.0018	0.5	0.15
Thallium	0.02	0.0089	2.	0.93
Zinc	0.005	0.0041	2.	0.18
Cyanide, total†	0.01	0.005	0.5	0.18
Phenolics, total†	0.03	0.009	3.5	1.2

*Mercury is analyzed by Cold Vapor.

Except for Cyanide, Phenolics, and Mercury, all other elements analyzed by ICP.

†Cyanide and Phenolics analyzed by distillation followed by automated colorimetry.

**Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

***Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-4
Inorganic Appendix IX Analyte List

Analyte	Waters		Soils***	
	LOQ** (mg/L)	MDL (mg/L)	LOQ** (mg/kg)	MDL (mg/kg)
Antimony	0.02	0.0085	2.	0.66
Arsenic	0.01	0.0049	1.	0.5
Barium	0.005	0.00042	0.5	0.032
Beryllium	0.005	0.00034	0.5	0.059
Cadmium	0.005	0.00087	0.5	0.054
Chromium	0.005	0.0022	0.5	0.2
Cobalt	0.005	0.0016	0.5	0.14
Copper	0.01	0.0021	1.	0.19
Lead	0.02	0.0093	2.	0.79
Mercury*	0.0002	0.00016	0.1	0.0028
Nickel	0.01	0.0038	1.	0.2
Selenium	0.01	0.0047	1.	0.47
Silver	0.005	0.0018	0.5	0.15
Thallium	0.02	0.0089	2.	0.93
Tin	0.02	0.005	10.	0.41
Vanadium	0.005	0.0017	0.5	0.16
Zinc	0.005	0.0041	2.	0.18
Cyanide, total†	0.01	0.005	0.5	0.18
Sulfide, total††	2.	0.53	30	8.4

*Mercury is analyzed by Cold Vapor.

Except for Cyanide, Sulfide, and Mercury, all other elements are analyzed by ICP.

†Cyanide is analyzed by distillation followed by automated colorimetry.

††Sulfide is analyzed by 9034 (modified), titrimetric analysis.

**Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

***Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-5
Metals by ICP/MS List

Analyte	Waters		Soils***	
	LOQ** (mg/L)	MDL (mg/L)	LOQ** (mg/kg)	MDL (mg/kg)
Aluminum	0.1	0.025	10	0.74
Antimony	0.001	0.00009	0.1	0.0027
Arsenic	0.0002	0.000059	0.02	0.0055
Barium	0.00025	0.000073	0.2	0.051
Beryllium	0.0001	0.000012	0.01	0.0031
Cadmium	0.0001	0.000027	0.02	0.0036
Calcium	0.05	0.013	20	3.5
Chromium	0.001	0.000071	0.1	0.018
Cobalt	0.0001	0.000018	0.01	0.00056
Copper	0.001	0.00023	0.1	0.018
Iron	0.075	0.016	20	5.8
Lead	0.001	0.00021	0.1	0.028
Magnesium	0.01	0.0014	1	0.28
Manganese	0.00075	0.00018	0.2	0.032
Molybdenum	0.001	0.000043	0.1	0.01
Nickel	0.0002	0.000058	0.05	0.0098
Potassium	0.05	0.0072	5	1
Selenium	0.001	0.0002	0.1	0.017
Silver	0.0005	0.000081	0.05	0.0039
Sodium	0.2	0.027	20	3.3
Strontium	0.0005	0.000044	0.1	0.023
Thallium	0.0005	0.00013	0.01	0.0023
Tin	0.0002	0.000039	1	0.24
Titanium	0.001	0.0002	0.2	0.049
Vanadium	0.0002	0.000025	0.02	0.0041
Zinc	0.01	0.0019	0.5	0.1

**Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

***Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

Method 6020 (ICP/MS) – LOQ and MDLs are evaluated annually and subject to change.

Table B4-6
Miscellaneous Chemistry Analyte List

Parameter	Waters		Soils**	
	LOQ* (mg/L)	MDL (mg/L)	LOQ* (mg/kg)	MDL (mg/kg)
Cyanide, total	0.01	0.005	0.5	0.18
Hexane Extractable Materials (1664A)	5.	1.7	N/A	N/A
Moisture	N/A	N/A	0.5 wt.%	0.5 wt.%
Phenolics, total	0.03	0.009	3.5	1.2
Sulfide, total	2.	0.53	30	8.4
TOC	2.	0.5	170	60
Total Nitrite/Nitrate	0.1	0.04	N/A	N/A
TOX	20	7.	200	70
TPH (418.1)	1.3	0.4	69	23

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-7
Volatile Full Compound List by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Dichlorodifluoromethane	5.	2.	5.	2.
Chloromethane	5.	1.	5.	2.
Vinyl Chloride	5.	1.	5.	1.
Bromomethane	5.	1.	5.	2.
Chloroethane	5.	1.	5.	2.
Trichlorofluoromethane	5.	2.	5.	2.
1,1-Dichloroethene	5.	0.8	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
Methylene Chloride	5.	2.	5.	2.
trans-1,2-Dichloroethene	5.	0.8	5.	1.
2,2-Dichloropropane	5.	1.	5.	1.
cis-1,2-Dichloroethene	5.	0.8	5.	1.
Chloroform	5.	0.8	5.	1.
Bromochloromethane	5.	1.	5.	1.
1,1,1-Trichloroethane	5.	0.8	5.	1.
Carbon Tetrachloride	5.	1.	5.	1.
1,1-Dichloropropene	5.	1.	5.	1.
Benzene	5.	0.5	5.	0.5
1,2-Dichloroethane	5.	1.	5.	1.
Trichloroethene	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
Dibromomethane	5.	1.	5.	1.
Bromodichloromethane	5.	1.	5.	1.
Toluene	5.	0.7	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
Tetrachloroethene	5.	0.8	5.	1.
1,3-Dichloropropane	5.	1.	5.	1.
Dibromochloromethane	5.	1.	5.	1.
1,2-Dibromoethane	5.	1.	5.	1.
Chlorobenzene	5.	0.8	5.	1.
1,1,1,2-Tetrachloroethane	5.	1.	5.	1.
Ethylbenzene	5.	0.8	5.	1.

Table B4-7 – Continued
Volatile Full Compound List by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
m+p-Xylene	5.	0.8	5.	1.
o-Xylene	5.	0.8	5.	1.
Styrene	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
Isopropylbenzene	5.	1.	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.
Bromobenzene	5.	1.	5.	1.
1,2,3-Trichloropropane	5.	1.	5.	1.
n-Propylbenzene	5.	1.	5.	1.
2-Chlorotoluene	5.	1.	5.	1.
1,3,5-Trimethylbenzene	5.	1.	5.	1.
4-Chlorotoluene	5.	1.	5.	1.
tert-Butylbenzene	5.	1.	5.	1.
1,2,4-Trimethylbenzene	5.	1.	5.	1.
sec-Butylbenzene	5.	1.	5.	1.
p-Isopropyltoluene	5.	1.	5.	1.
1,3-Dichlorobenzene	5.	1.	5.	1.
1,4-Dichlorobenzene	5.	1.	5.	1.
n-Butylbenzene	5.	1.	5.	1.
1,2-Dichlorobenzene	5.	1.	5.	1.
1,2-Dibromo-3-chloropropane	5.	2.	5.	2.
1,2,4-Trichlorobenzene	5.	1.	5.	1.
Hexachlorobutadiene	5.	2.	5.	2.
Naphthalene	5.	1.	5.	1.
1,2,3-Trichlorobenzene	5.	1.	5.	1.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-8
Volatile Priority Pollutant Compound List by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1,1,1-Trichloroethane	5.	0.8	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
1,1-Dichloroethene	5.	0.8	5.	1.
1,2-Dichloroethane	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
2-Chloroethylvinyl ether	10	2.	10	2.
Acrolein	100	40	100	20
Acrylonitrile	20	4.	20	4.
Benzene	5.	0.5	5.	0.5
Bromodichloromethane	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
Bromomethane	5.	1.	5.	2.
Carbon tetrachloride	5.	1.	5.	1.
Chlorobenzene	5.	0.8	5.	1.
Chloroethane	5.	1.	5.	2.
Chloroform	5.	0.8	5.	1.
Chloromethane	5.	1.	5.	2.
cis-1,2-Dichloroethene	5.	0.8	5.	1.
cis-1,3-Dichloropropene	5.	1.	5.	1.
Dibromochloromethane	5.	1.	5.	1.
Ethylbenzene	5.	0.8	5.	1.
Methylene chloride	5.	2.	5.	2.
Tetrachloroethene	5.	0.8	5.	1.
Toluene	5.	0.7	5.	1.
trans-1,2-Dichloroethene	5.	0.8	5.	1.
trans-1,3-Dichloropropene	5.	1.	5.	1.
Trichloroethene	5.	1.	5.	1.
Trichlorofluoromethane	5.	2.	5.	2.
Vinyl chloride	5.	1.	5.	1.
Xylene (total)	5.	0.8	5.	1.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-9
Appendix IX Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Chloromethane	5.	1.	5.	2.
Bromomethane	5.	1.	5.	2.
Vinyl chloride	5.	1.	5.	1.
Dichlorodifluoromethane	5.	2.	5.	2.
Chloroethane	5.	1.	5.	2.
Methyl iodide	5.	1.	5.	3.
Acrolein	100	40	100	20
Acrylonitrile	20	4.	20	4.
Acetonitrile	100	25	100	25
Methylene chloride	5.	2.	5.	2.
Acetone	20	6.	20	7.
Trichlorofluoromethane	5.	2.	5.	2.
Carbon disulfide	5.	1.	5.	1.
Propionitrile	100	30	100	30
1,1-Dichloroethene	5.	0.8	5.	1.
Allyl chloride	5.	1.	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
trans-1,2-Dichloroethene	5.	0.8	5.	1.
Chloroform	5.	0.8	5.	1.
1,2-Dichloroethane	5.	1.	5.	1.
Methacrylonitrile	50	10	50	5.
2-Butanone	10	3.	10	4.
Dibromomethane	5.	1.	5.	1.
1,1,1-Trichloroethane	5.	0.8	5.	1.
1,4-Dioxane	250	70	250	70
Carbon tetrachloride	5.	1.	5.	1.
Isobutyl alcohol	250	100	250	100
Vinyl acetate	10	2.	10	2.
Bromodichloromethane	5.	1.	5.	1.
2-Chloro-1,3-butadiene	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
trans-1,3-Dichloropropene	5.	1.	5.	1.

Table B4-9 – Continued
Appendix IX Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Trichloroethene	5.	1.	5.	1.
Dibromochloromethane	5.	1.	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
1,2-Dibromoethane	5.	1.	5.	1.
cis-1,2-Dichloroethene	5.	0.8	5.	1.
Benzene	5.	0.5	5.	0.5
cis-1,3-Dichloropropene	5.	1.	5.	1.
Methyl methacrylate	5.	1.	5.	1.
1,1,1,2-Tetrachloroethane	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
trans-1,4-Dichloro-2-butene	50	15	50	10
1,2,3-Trichloropropane	5.	1.	5.	1.
2-Hexanone	10	3.	10	3.
4-Methyl-2-pentanone	10	3.	10	3.
Tetrachloroethene	5.	0.8	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.
Toluene	5.	0.7	5.	1.
Ethyl methacrylate	5.	1.	5.	1.
Chlorobenzene	5.	0.8	5.	1.
Pentachloroethane	5.	1.	5.	1.
Ethylbenzene	5.	0.8	5.	1.
1,2-Dibromo-3-chloropropane	5.	2.	5.	2.
Styrene	5.	1.	5.	1.
Xylenes (total)	5.	0.8	5.	1.

For samples preserved with 1:1 HCl to pH <2, low recovery of acid labile compounds is likely to occur.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDL are evaluated annually and subject to change.

Table B4-10
TCL3.2 Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Chloromethane	5.	1.	5.	2.
Bromomethane	5.	1.	5.	2.
Vinyl chloride	5.	1.	5.	1.
Chloroethane	5.	1.	5.	2.
Methylene chloride	5.	2.	5.	2.
Acetone	20	6.	20	7.
Carbon disulfide	5.	1.	5.	1.
1,1-Dichloroethene	5.	0.8	5.	1.
Chloroform	5.	0.8	5.	1.
1,2-Dichloroethane	5.	1.	5.	1.
2-Butanone	10	3.	10	4.
1,1,1-Trichloroethane	5.	0.8	5.	1.
Carbon tetrachloride	5.	1.	5.	1.
Bromodichloromethane	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
trans-1,3-Dichloropropene	5.	1.	5.	1.
Trichloroethene	5.	1.	5.	1.
Dibromochloromethane	5.	1.	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
Benzene	5.	0.5	5.	0.5
cis-1,3-Dichloropropene	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
2-Hexanone	10	3.	10	3.
4-Methyl-2-pentanone	10	3.	10	3.
Tetrachloroethene	5.	0.8	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.

Table B4-10 – Continued
TCL3.2 Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Toluene	5.	0.7	5.	1.
Chlorobenzene	5.	0.8	5.	1.
Ethylbenzene	5.	0.8	5.	1.
Styrene	5.	1.	5.	1.
Xylenes (total)	5.	0.8	5.	1.
cis-1,2-Dichloroethene	5.	0.8	5.	1.

For samples preserved with 1:1 HCl to pH <2, low recovery of acid labile compounds is likely to occur.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDL are evaluated annually and subject to change.

Table B4-11
TCL4.2 Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1,1-Dichloroethane	5.	1.	5.	1.
trans-1,2-Dichloroethene	5.	0.8	5.	1.
1,1,1-Trichloroethane	5.	0.8	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
1,1-Dichloroethene	5.	0.8	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
1,2,4-Trichlorobenzene	5.	1.	5.	1.
1,2-Dibromo-3-chloropropane	5.	2.	5.	2.
1,2-Dibromoethane	5.	1.	5.	1.
1,2-Dichlorobenzene	5.	1.	5.	1.
1,2-Dichloroethane	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
1,3-Dichlorobenzene	5.	1.	5.	1.
1,4-Dichlorobenzene	5.	1.	5.	1.
2-Butanone	10	3.	10	4.
2-Hexanone	10	3.	10	3.
4-Methyl-2-pentanone	10	3.	10	3.
Acetone	20	6.	20	7.
Benzene	5.	0.5	5.	0.5
Bromodichloromethane	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
Bromomethane	5.	1.	5.	2.
Carbon disulfide	5.	1.	5.	1.
Carbon tetrachloride	5.	1.	5.	1.
Chlorobenzene	5.	0.8	5.	1.
Chloroethane	5.	1.	5.	2.
Chloroform	5.	0.8	5.	1.
Chloromethane	5.	1.	5.	2.
cis-1,2-Dichloroethene	5.	0.8	5.	1.
cis-1,3-Dichloropropene	5.	1.	5.	1.
Cyclohexane	5.	2.	5.	1.

Table B4-11 – Continued
TCL4.2 Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Dibromochloromethane	5.	1.	5.	1.
Dichlorodifluoromethane	5.	2.	5.	2.
Ethylbenzene	5.	0.8	5.	1.
Freon 113	10	2.	10	2.
Isopropylbenzene	5.	1.	5.	1.
Methyl Acetate	5.	1.	5.	2.
Methyl *t*-butyl ether	5.	0.5	5.	0.5
Methylcyclohexane	5.	1.	5.	1.
Methylene chloride	5.	2.	5.	2.
Styrene	5.	1.	5.	1.
Tetrachloroethene	5.	0.8	5.	1.
Toluene	5.	0.7	5.	1.
trans-1,2-Dichloroethene	5.	0.8	5.	1.
trans-1,3-Dichloropropene	5.	1.	5.	1.
Trichloroethene	5.	1.	5.	1.
Trichlorofluoromethane	5.	2.	5.	2.
Vinyl chloride	5.	1.	5.	1.
Xylenes (total)	5.	0.8	5.	1.

For samples preserved with 1:1 HCl to pH <2, low recovery of acid labile compounds is likely to occur.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDL are evaluated annually and subject to change.

Table B4-12
Semivolatile Full Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Acenaphthene	10	1.	330	33
Acenaphthylene	10	1.	330	33
Acetophenone	10	2.	330	67
Aramite[2]	50	1.	1700	33
2-Acetylaminofluorene	10	2.	330	67
4-Aminobiphenyl	10	2.	830	170
Aniline	10	1.	330	33
Anthracene	10	1.	330	33
Benzidine	100	20	3300	670
Benzo(a)anthracene	10	1.	330	33
Benzo(b)fluoranthene	10	1.	330	33
Benzo(k)fluoranthene	10	1.	330	33
Benzo(g,h,i)perylene	10	1.	330	33
Benzo(a)pyrene	10	1.	330	33
Benzyl alcohol	20	5.	330	170
bis (2-Chloroethoxy)methane	10	1.	330	33
bis(2-Chloroethyl)ether	10	1.	330	33
bis(2-Chloroisopropyl)ether	10	1.	330	33
bis(2-Ethylhexyl)phthalate	10	2.	330	170
4-Bromophenyl phenylether	10	1.	330	33
Butylbenzylphthalate	10	2.	330	67
4-Chloroaniline	10	1.	330	33
Carbazole	10	1.	330	33
Chlorobenzilate	20	3.	330	33
4-Chloro-3-methylphenol	10	1.	330	67
2-Chloronaphthalene	10	1.	330	33
2-Chlorophenol	10	1.	330	33
4-Chlorophenyl phenylether	10	1.	330	33
Chrysene	10	1.	330	33
2-Methylnaphthalene	10	1.	330	33
3 or 4-methyl phenol[3]	10	2.	330	67

Table B4-12 – Continued
Semivolatile Full Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Diallate (*cis/trans*)	10	1.	330	33
Dibenzofuran	10	1.	330	33
Di-*n*-butylphthalate	10	2.	330	67
Dibenz(a,h)anthracene	10	1.	330	33
1,2-Dichlorobenzene	10	1.	330	33
1,3-Dichlorobenzene	10	1.	330	33
1,4-Dichlorobenzene	10	1.	330	33
3,3'-Dichlorobenzidine	10	1.	670	67
2,4-Dichlorophenol	10	1.	330	33
2,6-Dichlorophenol	10	2.	330	67
Diethylphthalate	10	2.	330	67
Dimethoate	20	3.	330	33
p-(Dimethylamino)azobenzene	10	2.0	330	67
7,12-Dimethylbenz(a)anthracene	10	2.	330	33
3,3'-Dimethylbenzidine	25	10.	830	170
a,a-Dimethylphenethylamine[2]	50	1.	1700	33
2,4-Dimethylphenol	10	1.	330	33
Dimethylphthalate	10	2.	330	67
1,3-Dinitrobenzene	10	1.	330	67
4,6-Dinitro-2-methylphenol	25	5.	830	170
2,4-Dinitrophenol	60	20	2000	670
2,4-Dinitrotoluene	10	1.	330	67
2,6-Dinitrotoluene	10	1.	330	33
Di-*n*-octylphthalate	10	2.	330	67
1,2-Diphenylhydrazine[4]	10	1.	330	33
Ethylmethanesulfonate	10	2.	330	67
Fluoranthene	10	1.	330	33
Fluorene	10	1.	330	33
Hexachlorobenzene	10	1.	330	33
Hexachlorobutadiene	10	1.	330	67
Hexachlorocyclopentadiene	25	5.	670	170
Hexachloroethane	10	1.	330	33

Table B4-12 – Continued
Semivolatile Full Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Hexachloropropene	10	2.	330	100
Indeno(1,2,3-cd)pyrene	10	1.	330	33
Isodrin	10	1.	330	33
Isophorone	10	1.	330	33
Isosafrole	10	1.	330	67
Methapyrilene	10	3.	330	100
3-Methylcholanthrene	10	2.	330	67
Methylmethanesulfonate	10	1.	330	33
2-Methylphenol	10	1.	330	33
1-Methylnaphthalene	10	1.	330	33
2-Methylnaphthalene	10	1.	330	33
Naphthalene	10	1.	330	33
1,4-Naphthoquinone	100	10	3300	830
1-Naphthylamine	25	5.	830	170
2-Naphthylamine	25	5.	830	170
2-Nitroaniline	10	1.	330	33
3-Nitroaniline	10	1.	330	67
4-Nitroaniline	10	1.	330	67
Nitrobenzene	10	1.	330	33
2-Nitrophenol	10	1.	330	33
4-Nitrophenol	50	10	830	170
4-Nitroquinoline-1-oxide	100	20	1700	330
n-Nitrosodi-*n*-butylamine	10	2.	330	67
n-Nitrosodiethylamine	10	2.	330	67
n-Nitrosodimethylamine	10	2.	330	67
n-Nitrosodiphenylamine[1]	10	2.	330	33
n-Nitrosodi-*n*-propylamine	10	1.	330	33
n-Nitrosomethylethylamine	10	2.	330	67
n-Nitrosomorpholine	10	2.	330	67
n-Nitrosopiperidine	10	2.	330	67
n-Nitrosopyrrolidine	10	2.	330	67
5-Nitro-*o*-toluidine	10	3.	830	170

Table B4-12 – Continued
Semivolatile Full Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
2,2'-oxybis(1-Chloropropane)	25	1.	330	33
Pentachlorobenzene	10	2.	330	67
Pentachloronitrobenzene	10	2.	330	67
Pentachlorophenol	25	3.	830	170
Phenacetin	10	2.	330	67
Phenanthrene	10	1.	330	33
Phenol	10	1.	330	33
1,4-Phenylenediamine	200	60	6700	2500
2-Picoline	10	2.	330	67
Pronamide	10	1.	330	33
Pyrene	10	1.	330	33
Pyridine	10	2.	330	67
Safrole	10	2.	330	67
1,2,4,5-Tetrachlorobenzene	10	2.	330	67
2,3,4,6-Tetrachlorophenol	10	2.	330	67
Tetraethyldithiopyrophosphate	10	1.	330	67
Thionazin	10	2.	330	67
o-Toluidine	10	1.	330	67
1,2,4-Trichlorobenzene	10	1.	330	33
2,4,5-Trichlorophenol	10	1.	330	33
2,4,6-Trichlorophenol	10	1.	330	33
O,O,O-Triethylphosphorothioate	10	2.	330	67
1,3,5-Trinitrobenzene	20	5.	670	170

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1]*n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

[2]Aramite and a,a-dimethylphenethylamine can be determined upon request.

[3]3-methylphenol and 4-methylphenol cannot be resolved under this analysis. The combined total of both compounds is reported as 4-methylphenol.

[4]1,2-Diphenylhydrazine cannot be distinguished from azobenzene, therefore, the value reported represents the combined total of both.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-13

Semivolatile Priority Pollutant Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
2-Chlorophenol	10	1.	330	33
Phenol	10	1.	330	33
2-Nitrophenol	10	1.	330	33
2,4-Dimethylphenol	10	1.	330	33
2,4-Dichlorophenol	10	1.	330	33
4-Chloro-3-methylphenol	10	1.	330	67
2,4,6-Trichlorophenol	10	1.	330	33
2,4-Dinitrophenol	60	20	2000	670
4-Nitrophenol	50	10	830	170
4,6-Dinitro-2-methylphenol	25	5.	830	170
Pentachlorophenol	25	3.	830	170
n-Nitrosodimethylamine	10	2.	330	67
bis(2-Chloroethyl)ether	10	1.	330	33
1,3-Dichlorobenzene	10	1.	330	33
1,4-Dichlorobenzene	10	1.	330	33
1,2-Dichlorobenzene	10	1.	330	33
bis(2-Chloroisopropyl)ether	10	1.	330	33
Hexachloroethane	10	1.	330	33
n-Nitrosodi-*n*-propylamine	10	1.	330	33
Nitrobenzene	10	1.	330	33
Isophorone	10	1.	330	33
bis (2-Chloroethoxy)methane	10	1.	330	33
1,2,4-Trichlorobenzene	10	1.	330	33
Naphthalene	10	1.	330	33
Hexachlorobutadiene	10	1.	330	67
Hexachlorocyclopentadiene	25	5.	670	170
2-Chloronaphthalene	10	1.	330	33
Acenaphthylene	10	1.	330	33
Dimethylphthalate	10	2.	330	67
2,6-Dinitrotoluene	10	1.	330	33
Acenaphthene	10	1.	330	33
2,4-Dinitrotoluene	10	1.	330	67

Table B4-13 – Continued
Semivolatile Priority Pollutant Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Fluorene	10	1.	330	33
4-Chlorophenyl phenylether	10	1.	330	33
Diethylphthalate	10	2.	330	67
1,2-Diphenylhydrazine	10	1.	330	33
n-Nitrosodiphenylamine[1]	10	2.	330	33
4-Bromophenyl phenylether	10	1.	330	33
Hexachlorobenzene	10	1.	330	33
Phenanthrene	10	1.	330	33
Anthracene	10	1.	330	33
Di-*n*-butylphthalate	10	2.	330	67
Fluoranthene	10	1.	330	33
Pyrene	10	1.	330	33
Benzidine	100	20	3300	670
Butylbenzylphthalate	10	2.	330	67
Benzo(a)anthracene	10	1.	330	33
Chrysene	10	1.	330	33
3,3'-Dichlorobenzidine	10	1.	670	67
bis(2-Ethylhexyl)phthalate	10	2.	330	170
Di-*n*-octylphthalate	10	2.	330	67
Benzo(b)fluoranthene	10	1.	330	33
Benzo(k)fluoranthene	10	1.	330	33
Benzo(a)pyrene	10	1.	330	33
Indeno(1,2,3-cd)pyrene	10	1.	330	33
Dibenz(a,h)anthracene	10	1.	330	33
Benzo(g,h,i)perylene	10	1.	330	33

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1]*n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-14
Appendix IX Semivolatile Compounds by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Acenaphthene	10	1.	330	33
Acenaphthylene	10	1.	330	33
Acetophenone	10	2.	330	67
2-Acetylaminofluorene	10	2.	330	67
4-Aminobiphenyl	10	2.	830	170
Aniline	10	1.	330	33
Anthracene	10	1.	330	33
Aramite[2]	50	1.	1700	33
Benzo(a)anthracene	10	1.	330	33
Benzo(b)fluoranthene	10	1.	330	33
Benzo(k)fluoranthene	10	1.	330	33
Benzo(g,h,i)perylene	10	1.	330	33
Benzo(a)pyrene	10	1.	330	33
Benzyl alcohol	20	5.	330	170
bis (2-Chloroethoxy)methane	10	1.	330	33
bis(2-Chloroethyl)ether	10	1.	330	33
bis(2-Chloroisopropyl)ether	10	1.	330	33
bis(2-Ethylhexyl)phthalate	10	2.	330	170
4-Bromophenyl phenylether	10	1.	330	33
Butylbenzylphthalate	10	2.	330	67
4-Chloroaniline	10	1.	330	33
Chlorobenzilate	20	3.	330	33
4-Chloro-3-methylphenol	10	1.	330	67
2-Chloronaphthalene	10	1.	330	33
2-Chlorophenol	10	1.	330	33
4-Chlorophenyl phenylether	10	1.	330	33
Chrysene	10	1.	330	33
2-Methylphenol	10	1.	330	33
3- or 4-Methylphenol[3]	10	2.	330	67
Diallate (*cis/trans*)	10	1.	330	33
Dibenzofuran	10	1.	330	33

Table B4-14 – Continued
Appendix IX Semivolatile Compounds by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Di-*n*-butylphthalate	10	2.	330	67
Dibenz(a,h)anthracene	10	1.	330	33
1,2-Dichlorobenzene	10	1.	330	33
1,3-Dichlorobenzene	10	1.	330	33
1,4-Dichlorobenzene	10	1.	330	33
3,3'-Dichlorobenzidine	10	1.	670	67
2,4-Dichlorophenol	10	1.	330	33
2,6-Dichlorophenol	10	2.	330	67
Diethylphthalate	10	2.	330	67
Dimethoate	20	3.	330	33
p-(Dimethylamino)azobenzene	10	2.	330	67
7,12-Dimethylbenz(a)anthracene	10	2.	330	33
3,3'-Dimethylbenzidine	25	10	830	170
a,a-Dimethylphenethylamine[2]	50	1	1700	33
2,4-Dimethylphenol	10	1.	330	33
Dimethylphthalate	10	2.	330	67
1,3-Dinitrobenzene	10	1.	330	67
4,6-Dinitro-2-methylphenol	25	5.	830	170
2,4-Dinitrophenol	60	20	2000	670
2,4-Dinitrotoluene	10	1.	330	67
2,6-Dinitrotoluene	10	1.	330	33
Di-*n*-octylphthalate	10	2.	330	67
Ethylmethanesulfonate	10	2.	330	67
Fluoranthene	10	1.	330	33
Fluorene	10	1.	330	33
Hexachlorobenzene	10	1.	330	33
Hexachlorobutadiene	10	1.	330	67
Hexachlorocyclopentadiene	25	5.	670	170
Hexachloroethane	10	1.	330	33
Hexachloropropene	10	2.	330	100
Indeno(1,2,3-cd)pyrene	10	1.	330	33
Isodrin	10	1.	330	33

Table B4-14 – Continued
Appendix IX Semivolatile Compounds by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Isophorone	10	1.	330	33
Isosafrole	10	1.	330	67
Methapyrilene	10	3.	330	100
3-Methylcholanthrene	10	2.	330	67
Methylmethanesulfonate	10	1.	330	33
1-Methylnaphthalene	10	1.	330	33
2-Methylnaphthalene	10	1.	330	33
Naphthalene	10	1.	330	33
1,4-Naphthoquinone	100	10	3300	830
1-Naphthylamine	25	5.	830	170
2-Naphthylamine	25	5.	830	170
2-Nitroaniline	10	1.	330	33
3-Nitroaniline	10	1.	330	67
4-Nitroaniline	10	1.	330	67
Nitrobenzene	10	1.	330	33
2-Nitrophenol	10	1.	330	33
4-Nitrophenol	50	10	830	170
4-Nitroquinoline-1-oxide	100	20	1700	330
n-Nitrosodiethylamine	10	2.	330	67
n-Nitrosodimethylamine	10	2.	330	67
n-Nitrosodi-*n*-butylamine	10	2.	330	67
n-Nitrosodi-*n*-propylamine	10	1.	330	33
n-Nitrosodiphenylamine[1]	10	2.	330	33
n-Nitrosomethylethylamine	10	2.	330	67
n-Nitrosomorpholine	10	2.	330	67
n-Nitrosopiperidine	10	2.	330	67
n-Nitrosopyrrolidine	10	2.	330	67
5-Nitro-*o*-toluidine	10	3.	830	170
Pentachlorobenzene	10	2.	330	67
Pentachloronitrobenzene	10	2.	330	67
Pentachlorophenol	25	3.	830	170
Phenacetin	10	2.	330	67

Table B4-14 – Continued
Appendix IX Semivolatile Compounds by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Phenanthrene	10	1.	330	33
Phenol	10	1.	330	33
1,4-Phenylenediamine	200	60	6700	2500
2-Picoline	10	2.	330	67
Pronamide	10	1.	330	33
Pyrene	10	1.	330	33
Pyridine	10	2.	330	67
Safrole	10	2.	330	67
1,2,4,5-Tetrachlorobenzene	10	2.	330	67
2,3,4,6-Tetrachlorophenol	10	2.	330	67
Tetraethyldithiopyrophosphate	10	1.	330	67
Thionazin	10	2.	330	67
o-Toluidine	10	1.	330	67
1,2,4-Trichlorobenzene	10	1.	330	33
2,4,5-Trichlorophenol	10	1.	330	33
2,4,6-Trichlorophenol	10	1.	330	33
O,O,O-Triethylphosphorothioate	10	2.	330	67
1,3,5-Trinitrobenzene	20	5.	670	170

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1]*n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

[2]Aramite and a,a-dimethylphenethylamine can be determined upon request.

[3]3-methylphenol and 4-methylphenol cannot be resolved under this analsis. The combined total of both compounds is reported as 4-methylphenol.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-15
TCL3.2 Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1,2,4-Trichlorobenzene	10	1.	330	33
1,2-Dichlorobenzene	10	1.	330	33
1,3-Dichlorobenzene	10	1.	330	33
1,4-Dichlorobenzene	10	1.	330	33
2,2'-Oxybis(1-Chloropropane)	25	1.	330	33
2,4,5-Trichlorophenol	10	1.	330	33
2,4,6-Trichlorophenol	10	1.	330	33
2,4-Dichlorophenol	10	1.	330	33
2,4-Dimethylphenol	10	1.	330	33
2,4-Dinitrotoluene	10	1.	330	67
2,6-Dinitrotoluene	10	1.	330	33
2-Chloronaphthalene	10	1.	330	33
2-Chlorophenol	10	1.	330	33
2-Methylnaphthalene	10	1.	330	33
2-Methylphenol	10	1.	330	33
2-Nitroaniline	10	1.	330	33
2-Nitrophenol	10	1.	330	33
3,3'-Dichlorobenzidine	10	1.	670	67
3-Nitroaniline	10	1.	330	67
4,6-Dinitro-2-methylphenol	25	5.	830	170
4-Bromophenyl-phenylether	10	1.	330	33
4-Chloro-3-methylphenol	10	1.	330	67
4-Chloroaniline	10	1.	330	33
4-Chlorophenyl-phenylether	10	1.	330	33
4-Methylphenol	10	2.	330	67
4-Nitroaniline	10	1.	330	67
4-Nitrophenol	50	10	830	170
Acenaphthene	10	1.	330	33
Acenaphthylene	10	1.	330	33
Anthracene	10	1.	330	33
Benzo(a)anthracene	10	1.	330	33
Benzo(a)pyrene	10	1.	330	33
Benzo(b)fluoranthene	10	1.	330	33
Benzo(g,h,i)perylene	10	1.	330	33
Benzo(k)fluoranthene	10	1.	330	33
bis(2-Chloroethoxy)methane	10	1.	330	33

Table B4-15 – Continued
TCL3.2 Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
bis(2-Chloroethyl)ether	10	1.	330	33
bis(2-Ethylhexyl)phthalate	10	2.	330	170
Butylbenzylphthalate	10	2.	330	67
Carbazole	10	1.	330	33
Chrysene	10	1.	330	33
Dibenz(a,h)anthracene	10	1.	330	33
Dibenzofuran	10	1.	330	33
Diethylphthalate	10	2.	330	67
Dimethylphthalate	10	2.	330	67
Di-*n*-butylphthalate	10	2.	330	67
Di-*n*-octylphthalate	10	2.	330	67
Fluoranthene	10	1.	330	33
Fluorene	10	1.	330	33
Hexachlorobenzene	10	1.	330	33
Hexachlorobutadiene	10	1.	330	67
Hexachlorocyclopentadiene	25	5.	670	170
Hexachloroethane	10	1.	330	33
Indeno(1,2,3-cd)pyrene	10	1.	330	33
Isophorone	10	1.	330	33
Naphthalene	10	1.	330	33
Nitrobenzene	10	1.	330	33
n-Nitroso-di-*n*-propylamine	10	1.	330	33
n-Nitrosodiphenylamine[1]	10	2.	330	33
Pentachlorophenol	25	3.	830	170
Phenanthrene	10	1.	330	33
Phenol	10	1.	330	33
Pyrene	10	1.	330	33

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1]*n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-16
TCL4.2 Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1,1'-Biphenyl	10	1.	330	33
2,2'-Oxybis(1-Chloropropane)	25	1.	330	33
2,4,5-Trichlorophenol	10	1.	330	33
2,4,6-Trichlorophenol	10	1.	330	33
2,4-Dichlorophenol	10	1.	330	33
2,4-Dimethylphenol	10	1.	330	33
2,4-Dinitrophenol	60	20	2000	670
2,4-Dinitrotoluene	10	1.	330	67
2,6-Dinitrotoluene	10	1.	330	33
2-Chloronaphthalene	10	1.	330	33
2-Chlorophenol	10	1.	330	33
2-Methylnaphthalene	10	1.	330	33
2-Methylphenol	10	1.	330	33
2-Nitroaniline	10	1.	330	33
2-Nitrophenol	10	1.	330	33
3,3'-Dichlorobenzidine	10	1.	670	67
3-Nitroaniline	10	1.	330	67
4,6-Dinitro-2-methylphenol	25	5.	830	170
4-Bromophenyl-phenylether	10	1.	330	33
4-Chloro-3-methylphenol	10	1.	330	67
4-Chloroaniline	10	1.	330	33
4-Chlorophenyl-phenylether	10	1.	330	33
4-Methylphenol	10	2.	330	67
4-Nitroaniline	10	1.	330	67
4-Nitrophenol	50	10	830	170
Acenaphthene	10	1.	330	33
Acenaphthylene	10	1.	330	33
Acetophenone	10	2.	330	67
Anthracene	10	1.	330	33
Atrazine	10	1.	330	33
Benzaldehyde	10	1.	330	33
Benzo(a)anthracene	10	1.	330	33
Benzo(a)pyrene	10	1.	330	33
Benzo(b)fluoranthene	10	1.	330	33
Benzo(g,h,i)perylene	10	1.	330	33
Benzo(k)fluoranthene	10	1.	330	33
bis(2-Chloroethoxy)methane	10	1.	330	33
bis(2-Chloroethyl)ether	10	1.	330	33

Table B4-16 – Continued
TCL4.2 Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
bis(2-Ethylhexyl)phthalate	10	2.	330	170
Butylbenzylphthalate	10	2.	330	67
Caprolactam	25	5.	830	170
Carbazole	10	1.	330	33
Chrysene	10	1.	330	33
Dibenz(a,h)anthracene	10	1.	330	33
Dibenzofuran	10	1.	330	33
Diethylphthalate	10	2.	330	67
Dimethylphthalate	10	2.	330	67
Di-*n*-butylphthalate	10	2.	330	67
Di-*n*-octylphthalate	10	2.	330	67
Fluoranthene	10	1.	330	33
Fluorene	10	1.	330	33
Hexachlorobenzene	10	1.	330	33
Hexachlorobutadiene	10	1.	330	67
Hexachlorocyclopentadiene	25	5.	670	170
Hexachloroethane	10	1.	330	33
Indeno(1,2,3-cd)pyrene	10	1.	330	33
Isophorone	10	1.	330	33
Naphthalene	10	1.	330	33
Nitrobenzene	10	1.	330	33
n-Nitroso-di-*n*-propylamine	10	1.	330	33
n-Nitrosodiphenylamine[1]	10	2.	330	33
Pentachlorophenol	25	3.	830	170
Phenanthrene	10	1.	330	33
Phenol	10	1.	330	33
Pyrene	10	1.	330	33

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1]*n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-17
Volatiles Halocarbons and Aromatics by GC (8021B)

Compound Name	Waters	
	LOQ* (µg/L)	MDL (µg/L)
1,1,1-Trichloroethane	1.	0.2
1,1,2,2-Tetrachloroethane	1.	0.2
1,1,2-Trichloroethane	1.	0.2
1,1-Dichloroethane	1.	0.2
1,1-Dichloroethene	1.	0.2
1,2-Dichlorobenzene	1.	0.2
1,2-Dichloroethane	1.	0.2
1,2-Dichloropropane	1.	0.2
1,3-Dichlorobenzene	1.	0.2
1,4-Dichlorobenzene	1.	0.2
Benzene	1.	0.2
Bromodichloromethane	1.	0.2
Bromoform	1.	0.2
Bromomethane	5.	0.5
Carbon Tetrachloride	1.	0.2
Chlorobenzene	1.	0.2
Chloroethane	1.	0.2
Chloroform	1.	0.2
Chloromethane	5.	0.5
cis-1,2-Dichloroethene	1.	0.2
cis-1,3-Dichloropropene	1.	0.2
Dibromochloromethane	1.	0.2
Dichlorodifluoromethane	2.	0.5
Ethylbenzene	1.	0.2
Methylene Chloride	2.	0.5
Tetrachloroethene	1.	0.2
Toluene	1.	0.2
trans-1,2-Dichloroethene	1.	0.2
trans-1,3-Dichloropropene	1.	0.2
Trichloroethene	1.	0.2
Trichlorofluoromethane	1.	0.2
Vinyl Chloride	1.	0.2
Xylene (total)	3.	0.6

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-18
Petroleum Analysis by GC (8021B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (mg/kg)	MDL (mg/kg)
Benzene	1.	0.2	5.	2.
Ethylbenzene	1.	0.2	5.	2.
Methyl *t*-butyl ether	1.	0.3	20	5.
Naphthalene	5.	1.	20	10
Toluene	1.	0.2	5.	2.
Total Xylene	3.	0.6	15	5.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and my not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-19
TPH GRO/DRO by GC (8015B)

Compound Name	Waters		Soils**	
	LOQ* (mg/L)	MDL (mg/L)	LOQ* (mg/kg)	MDL (mg/kg)
TPH-DRO	0.1	0.1	7.	4.
TPH-GRO	0.05	0.02	1.	0.2

NOTE: MDLs listed are higher than determined MDLs. This is because the method sums the total detectable area under the chromatographic plot in region of interest, instead of actual fuel peak area as the respective fuel.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-20
Pesticide/PCB Priority Pollutant Compound List by GC (8081A/8082)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
4,4-DDD	0.02	0.004	1.7	0.58
4,4-DDE	0.02	0.004	1.7	0.33
4,4-DDT	0.02	0.004	1.7	0.33
Aldrin	0.01	0.002	1.5	0.51
alpha-BHC	0.01	0.002	0.83	0.17
beta-BHC	0.04	0.012	0.83	0.17
Chlordane	0.5	0.07	17	4.
delta-BHC	0.01	0.003	0.83	0.17
Dieldrin	0.02	0.005	1.7	0.33
Endosulfan I	0.02	0.005	1.3	0.44
Endosulfan II	0.01	0.004	1.7	0.33
Endosulfan sulfate	0.027	0.009	1.7	0.33
Endrin	0.02	0.004	1.7	0.5
Endrin aldehyde	0.1	0.02	3.	1.
gamma-BHC (Lindane)	0.01	0.002	0.83	0.17
Heptachlor	0.01	0.002	0.83	0.17
Heptachlor epoxide	0.01	0.002	0.83	0.17
Methoxychlor	0.18	0.06	12	4.
PCB-1016	0.6	0.2	17	3.3
PCB-1221	1.2	0.4	30	10
PCB-1232	0.5	0.1	17	4.3
PCB-1242	0.6	0.2	17	4.
PCB-1248	0.9	0.3	18	6.
PCB-1254	0.6	0.2	17	3.3
PCB-1260	0.6	0.3	17	3.3
Toxaphene	1.	0.3	33	11

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-21
Appendix IX Organochlorine Pesticides/PCBs by GC (8081A/8082)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
4,4-DDD	0.02	0.004	1.7	0.58
4,4-DDE	0.02	0.004	1.7	0.33
4,4-DDT	0.02	0.004	1.7	0.33
Aldrin	0.01	0.002	1.5	0.51
alpha-BHC	0.01	0.002	0.83	0.17
beta-BHC	0.04	0.012	0.83	0.17
Chlordane	0.5	0.07	17	4.
delta-BHC	0.01	0.003	0.83	0.17
Dieldrin	0.02	0.005	1.7	0.33
Endosulfan I	0.01	0.004	1.3	0.44
Endosulfan II	0.02	0.005	1.7	0.33
Endosulfan sulfate	0.027	0.0090	1.7	0.33
Endrin	0.02	0.004	1.7	0.5
Endrin aldehyde	0.1	0.02	3.	1.
gamma-BHC (Lindane)	0.01	0.002	0.83	0.17
Heptachlor	0.01	0.002	0.83	0.17
Heptachlor epoxide	0.01	0.002	0.83	0.17
Kepone	0.2	0.07	7.	2.3
Methoxychlor	0.1	0.02	12	4.
PCB-1016	0.5	0.1	17	3.3
PCB-1221	1.2	0.4	30	10
PCB-1232	0.5	0.1	17	4.3
PCB-1242	0.6	0.2	17	4.
PCB-1248	0.9	0.3	18	6.
PCB-1254	0.6	0.2	17	3.3
PCB-1260	0.6	0.3	17	3.3
Toxaphene	1.	0.3	33	11

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-22
Appendix IX Organphosphate Pesticides/PCBs by GC (8141A)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Bolstar	2.	0.4	67	22
Coumaphos	3.	0.64	67	22
Demeton-O	2.	0.4	67	22
Demeton-S	2.	0.4	67	22
Diazinon	2.	0.4	67	22
Dichlorvos	2.	0.4	67	22
Disulfoton	2.	0.4	75	25
Dursban (Chlorpyrifos)	2.	0.4	67	22
EPN	4.	0.8	67	22
Ethion	2.	0.4	67	22
Ethoprop	2.	0.4	67	22
Ethyl parathion	2.	0.4	67	22
Famphur	2.	0.5	67	22
Fensulfothion	4.	0.9	67	22
Fenthion	2.	0.4	67	22
Guthion (Azinphos-methyl)	4.	0.8	67	22
Malathion	2.	0.4	67	22
Merphos	2.	0.4	67	22
Methyl parathion	2.	0.4	67	22
Mevinphos	2.	0.4	67	22
Naled	3.	0.6	67	22
Phorate	2.	0.4	67	22
Ronnel	2.	0.4	67	22
Stirophos	2.	0.4	67	22
Tokuthion	2.	0.4	67	22
Trichloronate	2.	0.4	67	22
Trithion	2.	0.4	67	22

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-23
TCL Pesticides/PCBs by GC
(OLM03.2 and OLM04.2 lists)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
4,4'-DDD	0.02	0.004	1.7	0.58
4,4'-DDE	0.02	0.004	1.7	0.33
4,4'-DDT	0.02	0.004	1.7	0.33
Aldrin	0.01	0.002	1.5	0.51
alpha-BHC	0.01	0.002	0.83	0.17
alpha-Chlordane	0.01	0.002	0.83	0.17
beta-BHC	0.04	0.012	0.83	0.17
delta-BHC	0.01	0.003	0.83	0.17
Dieldrin	0.02	0.005	1.7	0.33
Endosulfan I	0.01	0.004	1.3	0.44
Endosulfan II	0.02	0.005	1.7	0.33
Endosulfan sulfate	0.027	0.009	1.7	0.33
Endrin	0.02	0.004	1.7	0.5
Endrin aldehyde	0.1	0.020	3.	1.
Endrin ketone	0.02	0.004	1.7	0.33
gamma-BHC/Lindane	0.01	0.002	0.83	0.17
gamma-Chlordane	0.01	0.002	0.9	0.3
Heptachlor	0.01	0.002	0.83	0.17
Heptachlor epoxide	0.01	0.002	0.83	0.17
Methoxychlor	0.18	0.06	12	4.
PCB-1016	0.6	0.2	17	3.3
PCB-1221	1.2	0.4	30	10
PCB-1232	0.5	0.1	17	4.3
PCB-1242	0.6	0.2	17	4.
PCB-1248	0.9	0.3	18	6.
PCB-1254	0.6	0.2	17	3.3
PCB-1260	0.6	0.3	17	3.3
Toxaphene	1.	0.3	33	11

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-24
Herbicides by GC (8151A)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
2,4,5-T	0.05	0.01	1.7	0.5
2,4,5-TP	0.05	0.01	1.7	0.5
2,4-D	0.5	0.1	17	5.
2,4-DB	1.	0.3	17	5.
2,4-DP (Dichlorprop)	0.5	0.1	17	5.
Dalapon	1.25	0.25	60	20
Dicamba	0.3	0.06	3.	1.
Dinoseb	0.5	0.1	8.3	1.7
MCPA	200	50	15000	3000
MCPP	200	50	2500	600
Pentachlorophenol	0.05	0.01	1.7	0.33

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-25
PAHs by HPLC (8310)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Acenaphthene	8.	0.8	4.	0.6
Acenapthylene	8.	0.8	4.	0.6
Anthracene	0.1	0.02	0.08	0.009
Benzo(a)anthracene	0.05	0.01	0.1	0.02
Benzo(a)pyrene	0.05	0.01	0.2	0.03
Benzo(b)fluoranthene	0.1	0.02	0.2	0.04
Benzo(g,h,i)perylene	0.3	0.05	0.2	0.04
Benzo(k)fluoranthene	0.05	0.01	0.1	0.02
Chrysene	0.2	0.04	0.2	0.03
Dibenzo(a,h)anthracene	0.1	0.02	0.08	0.02
Fluoranthene	0.1	0.02	0.08	0.02
Fluorene	0.4	0.09	0.4	0.06
Indeno(1,2,3-cd)pyrene	0.2	0.04	0.2	0.04
Naphthalene	6.	0.7	5.	0.7
Phenanthrene	0.2	0.04	0.2	0.02
Pyrene	0.4	0.09	0.4	0.05

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

B5. Quality Control

The particular types and frequencies of quality control checks analyzed with each sample are defined in *USEPA SW-846 3rd Edition, Update III, 1996*, and *Methods for the Chemical Analysis of Waters and Wastes, USEPA, 600/4-79-020.* The quality control checks routinely performed during sample analysis include blanks, laboratory control samples, surrogates, duplicates, internal standards, and matrix spikes. In addition to these checks, some inorganic analyses employ serial dilutions and interference check samples.

Blanks (method, preparation) – Blanks are an analytical control consisting of a volume of deionized, distilled laboratory water for water samples, or a purified solid matrix for soil/sediment samples. (Metals use a digested reagent blank with soils.) They are treated with the same reagents, internal standards, and surrogate standards and carried through the entire analytical procedure. The blank is used to define the level of laboratory background contamination.

Laboratory Control Samples (LCS) or Reference materials – Aqueous and solid control samples of known composition are analyzed using the same sample preparation, reagents, and analytical methods employed for the sample. These materials may be purchased from NIST or commercial supply houses either as neat compounds or as solutions with certified concentrations, or prepared in the technical department. The accuracy and quality of the purchased standards are documented on certificates provided by the supply houses. Certificates are maintained on file in the laboratory. The accuracy information determined from reference materials and laboratory control samples is valuable because variables specific to sample matrix are eliminated. The acceptance criteria for this type of quality control is either dictated by the agency from whom the material is obtained or by statistical analysis of past information generated in the technical department. A LCS is analyzed with every sample preparation batch to demonstrate accuracy of the procedure and process control.

Surrogates (used for organic analysis only) – Each sample, matrix spike, matrix spike duplicate, and blank are spiked with surrogate compounds prior to purging and extraction in order to monitor preparation and analysis. Surrogates are used to evaluate analytical efficiency by measuring recovery. The recovery data is compared to method stipulated or statistically generated limits.

Duplicates (matrix or LCS spike duplicate – organics and inorganics; duplicate-inorganics) – A second aliquot of a matrix/sample is analyzed at the same time as the original sample in order to determine the precision of the method. The relative percent difference (RPD) between the two determinations is calculated and compared to values prescribed by the EPA or the laboratory's statistically generated limits.

Internal Standards (used for GC/MS and some GC analysis) – Internal standards are compounds added to every standard, blank, LCS, matrix spike, matrix spike duplicate, and sample at a known concentration, prior to analysis. The peak areas of the internal standards are used for internal standard quantitation as well as monitoring changes in the instrument response that may adversely affect quantification of target compounds.

Matrix Spikes – Matrix spikes are samples fortified with a target analyte and subjected to the entire analytical procedure. The recovery of the analyte(s) is calculated and indicates the appropriateness of the method for the matrix. The matrix spike and its duplicate is a pair of fortified samples from the same source. Analysis of the matrix spike duplicates yields precision and accuracy information. The acceptance criteria for percent recovery of spiked samples is prescribed by the EPA or determined by statistical analysis of historical data generated in the technical department.

Serial Dilutions (used for inorganics GFAA, ICP, and ICP/MS only) – If the analyte concentration is sufficiently high, an analysis of a five-fold dilution must agree within 10% of the original determination. If the dilution analysis is not within 10%, a chemical or physical interference effect should be suspected.

Interference Check Sample (ICP and ICP/MS) – To verify interelement and background correction factors a solution containing both interfering and analyte elements of known concentration is analyzed at the beginning and end of each analysis run or a minimum of twice per 8 hours.

Second Source Check – A second source check is analyzed using either the LCS or an ICV (Initial Calibration Verification). The second source is a standard that is made from a solution or neat purchased from a different vendor than that used for the calibration standards. For some organic custom mixes, the same vendor but a different lot and preparation is used. This ensures that potential problems with a vendor supply would be evident in the analysis. Some areas of the lab may use the continuing calibration verification standards as a second source from the initial calibration.

The results of all quality control samples are entered into the LIMS in the same way as the results of client samples. The computer is programmed to compare the individual values with the acceptance limits (statistically determined or method specified) and inform the analyst if the results of the quality control tests are in or out of specification. If the results are not within the acceptance criteria, corrective action suitable to the situation must be taken. This may include, but is not limited to, checking calculations, examining other quality control analyzed with the same batch of samples, qualifying results with a comment stating the observed deviation, and reanalysis of the samples in the batch. In addition, computerized reports on the results for all quality control analyses (including mean and standard deviation) are generated monthly. These are used by the Quality Assurance Department to check for trends that may indicate method bias. Control charts are plotted via computer and may be accessed at any time by all analysts.

The following tables list the specific QC used for each method and the applicable QC windows. These windows are generated statistically and are subject to change. Statistical limits are determined for recovery and relative percent difference (RPD) data using historical data (minimum of 20 data points) and applying a 99% confidence interval around the mean. The limits are generated every 6 months for SW-846 methods and annually for other methods, and updated as needed. The tables list the full list of analytes for a method. Sublists (TCL, PPL, etc.) may be reported based on the clients requirements. See Element B4 for the particular analytes associated with a regulatory list.

Table B5-1
Quality Control
Inorganics

Type	Acceptance Limits (%)	Frequency	Corrective Action
Matrix Spikes:	See Table B5-2 See Table B5-2A for ICP/MS	Each group of samples of similar matrix/level (≤20) each method	Analyze post-digestion spike sample
Matrix Spike Duplicate (RPD):	±20% RPD	Each group of samples of similar matrix/level (≤20) each method	Analyze post-digestion spike sample if not already run for MS, flag the data
Duplicates (RPD):	±20% RPD for sample values ≥5× LOQ	Each group of samples of similar matrix/level (≤20) each method	Flag the data
Blanks: Initial Calibration (ICB) Continuing Calibration (CCB)	**ICP and ICP/MS:** <3× IDL or blank <1/10 conc. of action level and samples not ±10% of action level **GFAA and CVAA:** <LOQ	Each element immediately after calibration verification at 10% frequency or every 2 hours (beginning and end of run min.)	Correct problem, recalibrate, and rerun
Preparation Blank (PB)	≤LOQ	Each SDG or batch (≤20 samples)	Redigest and reanalyze blank and associated samples if sample result <20× blank result
Serial Dilutions (excluding Hg):	Within ±10% of the original determination	Each group (≤20) of similar matrix/level	Flag the data
Interference Check Sample (ICP and ICP/MS only):	±20% of the true value for the analytes	Each element after Initial Calibration Verification at beginning and end of the run or min. of 2× per 8 hour	Recalibrate the instrument
Laboratory Control Sample:	See Table B5-2 See Table B5-2A for ICP/MS	Each SDG or batch (≤20 samples), each method	Redigest and reanalyze LCS and associated samples

Table B5-1 – Continued
Quality Control
Metals

Type	Acceptance Limits (%)	Frequency	Corrective Action
Post Digestion Spike:	**ICP and ICP/MS:** 75% to 125% **GFAA and CVAA:** 85% to 115%	When matrix spikes are outside 75% to 125% range	Flag the data

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

This criteria is for TAL, PPL, and Appendix IX metals.

Table B5-2
Statistical Acceptance Limits for Metals

Analyte	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Aluminum	93-112	75-125	97-177	75-125
Antimony	94-112	75-125	7-186	75-125
Arsenic	92-109	86-119	90-110	75-112
Barium	93-109	82-113	96-117	75-125
Beryllium	92-109	91-117	89-111	89-114
Cadmium	93-111	87-117	88-106	75-125
Calcium	93-113	78-122	97-119	75-125
Chromium	95-112	86-118	92-114	75-125
Cobalt	95-109	91-112	88-107	79-114
Copper	92-110	89-119	90-111	75-125
Iron	91-114	75-125	57-203	75-125
Lead[1]	80-120	80-120	81-139	80-120
Magnesium	93-110	75-125	93-128	75-125
Mercury[2]	80-120	80-120	84-117	80-120
Nickel	93-110	91-111	89-107	75-125
Potassium	80-120	75-125	96-132	75-125
Selenium	91-111	75-125	94-114	81-112
Silver	93-110	75-125	84-116	75-125
Sodium	87-117	75-125	48-130	75-125
Thallium	92-107	97-108	96-112	78-109
Vanadium	96-109	95-112	83-146	75-125
Zinc	94-112	80-120	91-110	75-125

[1]Analyzed by GFAA

[2]Analyzed by Cold Vapor

All other elements analyzed by ICP.

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

The acceptance limits above pertain to the TAL, PPL and Appendix IX lists.

Table B5-2A
Acceptance Limits for ICP/MS

Analyte	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Aluminum	80-120	75-125	66-134	75-125
Antimony	80-120	75-125	1-210	75-125
Arsenic	80-120	75-125	68-132	75-125
Barium	80-120	75-125	77-123	75-125
Beryllium	80-120	75-125	76-124	75-125
Cadmium	80-120	75-125	77-123	75-125
Calcium	80-120	75-125	72-128	75-125
Chromium	80-120	75-125	78-121	75-125
Cobalt	80-120	75-125	80-120	75-125
Copper	80-120	75-125	76-125	75-125
Iron	80-120	75-125	50-150	75-125
Lead	80-120	75-125	74-126	75-125
Magnesium	80-120	75-125	60-140	75-125
Manganese	80-120	75-125	78-122	75-125
Molybdenum	80-120	75-125	77-123	75-125
Nickel	80-120	75-125	78-122	75-125
Potassium	80-120	75-125	55-146	75-125
Selenium	80-120	75-125	74-126	75-125
Silver	80-120	75-125	60-180	75-125
Sodium	80-120	75-125	60-140	75-125
Strontium	80-120	75-125	73-127	75-125
Thallium	80-120	75-125	57-143	75-125
Tin	80-120	75-125	75-125	75-125
Titanium	80-120	75-125	56-145	75-125
Vanadium	80-120	75-125	68-132	75-125
Zinc	80-120	75-125	76-123	75-125

Acceptance limits are statistically derived or method-specified, whichever is more stringent.

Figure B5-1

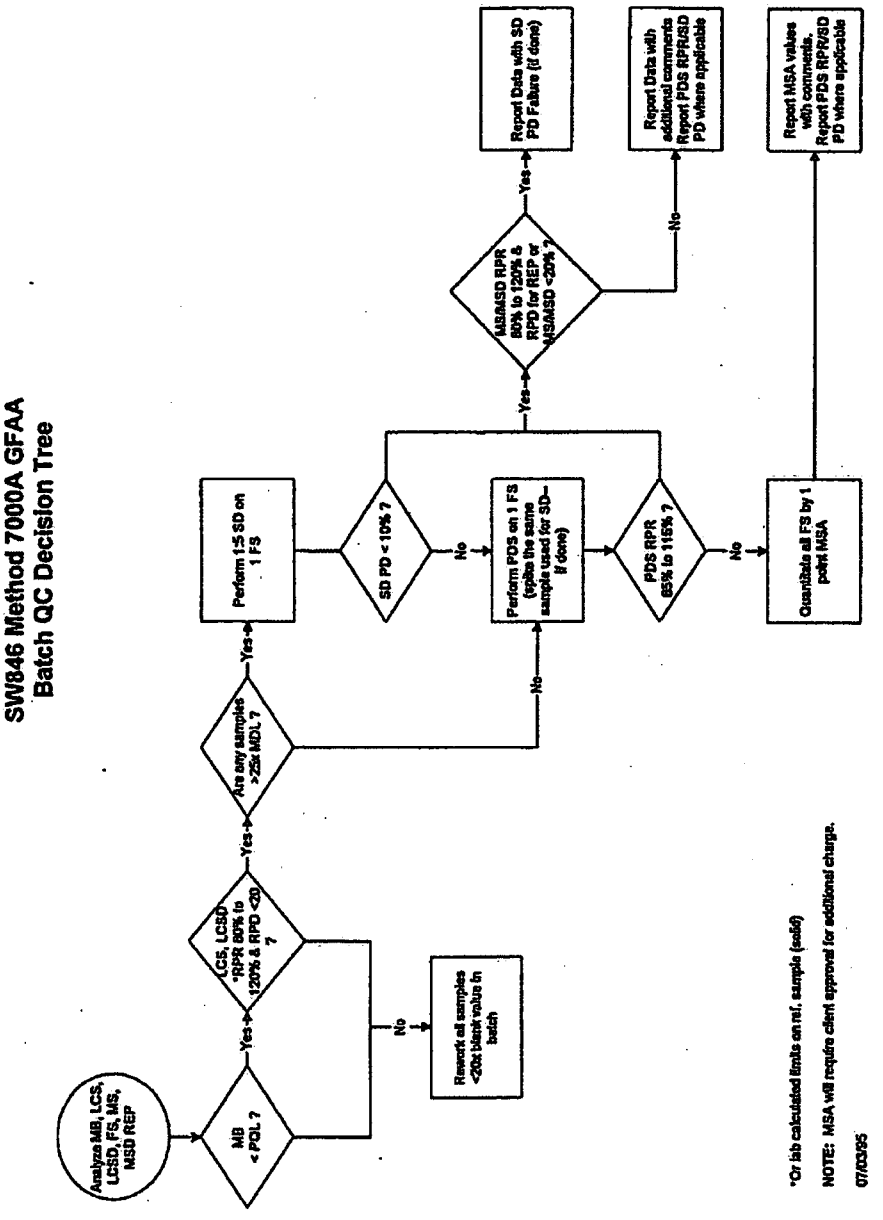

SW846 Method 7000A GFAA
Batch QC Decision Tree
Analyze MB, LCS, LCSD, FS, MS, MSD REP
MB < PQL ?
LCS, LCSD %RPR 80% to 120% & RPD <20 ?
Are any samples >25x MDL ?
Perform 1:5 SD on 1 FS
SD PD < 10% ?
Perform PDS on 1 FS (spike the same sample used for SD-if done)
PDS RPR 85% to 115% ?
Quantitate all FS by 1 point MSA
MS&MSD RPR 80% to 120% & RPD for REP or MSAMSD <20% ?
Report Data with SD PD Failure (if done)
Report Data with additional comments Report PDS RPR/SD PD where applicable
Report MSA values with comments, Report PDS RPR/SD PD where applicable
Reanalyze all samples <25x blank value in batch
Yes
No
*Or lab calculated limits on ref. sample (solid)
NOTE: MSA will require client approval for additional charge.
07/03/95

Table B5-3
Quality Control
Miscellaneous Chemistry

Parameter	Acceptance Limits (%)	Frequency	Corrective Action
Moisture:			
LCS/LCSD:	See Table B5-4	Each group (≤20) of samples	Batch is repeated
Duplicate:	≤15%	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Cyanide, total:			
Blanks: ICB: CCB: PB:	 ≤LOQ ≤LOQ ≤LOQ	 After every calibration After each CCV, which is every 10 samples Each group (≤20) of samples	 Recalibrate Reanalyze bracketed sample Batch is repeated
LCS: (LCSD when requested, or if there is not sufficient volume for Matrix QC)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated
MS:	See Table B5-4	Every 10 samples	Post digestion spike is performed, MSA is performed for CN by SW-846 9012A
Duplicates:	≤20%	Every 10 samples	Ensure that LCS meets acceptance criteria
Phenolics, total:			
Blanks:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Every 10 samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤20%	Every 10 samples	Ensure that LCS meets acceptance criteria
Sulfide, total:			
Blanks:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Duplicate:	≤20% (statistically evaluated)	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria

Table B5-3 – Continued
Quality Control
Miscellaneous Chemistry

Parameter	Acceptance Limits (%)	Frequency	Corrective Action
TPH (418.1):			
Blanks:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤34% wastewater ≤21% solid waste	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Hexane Extractable Materials (1664A):			
Blanks:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤18%	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
TOC:			
Blanks: ICB: CCB: PB:	 ≤LOQ ≤LOQ ≤LOQ	 After every calibration After every 10 injections Each group (≤20) of samples	 Recalibrate Reanalyze bracketed sample Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Every 10 samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤4%	Every 10 samples	Ensure that LCS meets acceptance criteria

Table B5-3 – Continued
Quality Control
Miscellaneous Chemistry

Parameter	Acceptance Limits (%)	Frequency	Corrective Action
TOX:			
Blanks:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Every 10 samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤20% solids	Every 10 samples for solids	Ensure that LCS meets acceptance criteria
Total Nitrite/Nitrate:			
Blanks:			
ICB:	≤LOQ	After initial calibration	Repeat calibration
PBW:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤2%	Every 10 samples	Ensure that LCS meets acceptance criteria

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-4
Quality Control
Statistical Acceptance Limits for Miscellaneous Chemistry

Parameter	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Cyanide, total	90-110	39-141	90-110	23-154
HEM (1664A)	79-114	79-114	N/A	N/A
Moisture	N/A	N/A	99-101	N/A
Phenolics, total	80-112	46-143	86-111	69-129
Sulfide, total	90-105	72-120	N/A	N/A
TOC	85-111	57-138	65-127	71-136
Total Nitrite/Nitrate	90-110	90-110	N/A	N/A
TOX	90-110	30-164	60-120	40-139
TPH (418.1)	54-113	39-132	66-124	38-146

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-5
Quality Control
Volatiles by GC/MS (8260B)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates:			Each sample, MS, MSD, LCS, and blank	Reanalyze sample if outside limits; if reanalysis confirms original, document on report and/or case narrative
Toluene-d_8	85-112	70-130		
Bromofluorobenzene	83-113	70-128		
1,2-Dichloroethane-d_4	82-112	70-121		
Dibromofluoromethane	81-120	70-129		
Matrix Spikes: Spike all compounds of interest	See Table B5-6		Each group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples: Spike all compounds of interest	See Table B5-6		Each group (≤20) of samples per matrix/level	Reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Spike all compounds of interest	≤30% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ for all compounds		Once for each 12-hour time period	Reanalyze blank and associated samples if blank outside limits
Internal Standards: Chlorobenzene-d_5 1,4-Dichlorobenzene-d_4	-50% to +100% of internal standard area of 12-hour STD RT Change ≤30 sec.		Each sample, MS, MSD, LCS, and blank	Reanalyze samples; if reanalysis confirms original, document on report or case narrative

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

This criteria is for PPL, Appendix IX, and TCL lists.

Table B5-6
Statistical Acceptance Limits for
Volatiles by GC/MS (8260B)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
1,1,1,2-Tetrachloroethane	83-114	83-119	78-115	58-128
1,1,1-Trichloroethane	83-127	82-135	74-121	53-137
1,1,2,2-Tetrachloroethane	72-119	69-121	64-121	37-151
1,1,2-Trichloroethane	86-113	77-125	83-114	50-147
1,1-Dichloroethane	83-127	85-135	79-124	60-133
1,1-Dichloroethene	79-130	78-146	69-133	48-147
1,1-Dichloropropene	84-116	87-127	75-121	57-130
1,2,3-Trichlorobenzene	67-114	66-121	70-117	15-140
1,2,3-Trichloropropane	78-117	73-125	67-126	36-161
1,2,4-Trichlorobenzene	65-114	66-121	68-119	13-140
1,2,4-Trimethylbenzene	78-117	75-132	74-117	35-153
1,2-Dibromo-3-chloropropane	59-120	53-125	49-127	29-147
1,2-Dibromoethane	81-114	78-120	77-114	61-125
1,2-Dichlorobenzene	81-112	82-117	81-114	49-126
1,2-Dichloroethane	77-132	73-136	76-126	57-137
1,2-Dichloropropane	80-117	81-121	78-119	60-129
1,3,5-Trimethylbenzene	78-116	77-124	72-118	29-153
1,3-Dichlorobenzene	81-114	79-123	76-112	45-130
1,3-Dichloropropane	84-119	82-121	80-117	61-129
1,4-Dichlorobenzene	84-116	81-122	81-113	45-129
2,2-Dichloropropane	79-123	78-134	72-123	53-135
2-Butanone	45-154	42-140	31-147	24-149
2-Chloroethyl Vinyl Ether	60-129	1-172	70-120	48-134
2-Chlorotoluene	78-115	78-121	73-114	48-141
2-Hexanone	47-150	44-140	41-144	27-149
4-Chlorotoluene	80-112	81-123	79-116	48-134
4-Methyl-2-pentanone	65-125	61-126	55-135	34-143
Acetone	22-179	12-153	29-165	9-178
Acrolein	28-146	25-144	55-128	14-143
Acrylonitrile	64-126	56-123	63-123	47-125
Benzene	85-117	83-128	83-118	52-141
Bromobenzene	80-118	83-121	77-113	52-131
Bromochloromethane	63-125	60-130	53-134	38-136
Bromodichloromethane	83-121	83-121	77-116	57-126
Bromoform	69-118	64-119	63-116	46-128

Table B5-6 – Continued
Statistical Acceptance Limits for
Volatiles by GC/MS (8260B)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Bromomethane	46-138	52-140	35-146	19-147
Carbon Disulfide	73-143	77-155	70-129	37-147
Carbon Tetrachloride	77-130	73-144	63-124	46-138
Chlorobenzene	85-115	83-120	81-112	59-125
Chloroethane	59-133	63-142	50-137	33-147
Chloroform	86-124	82-131	81-117	57-135
Chloromethane	69-136	70-148	44-139	21-155
cis-1,2-Dichloroethene	84-117	83-126	83-118	57-131
cis-1,3-Dichloropropene	78-114	76-117	80-113	50-129
Dibromochloromethane	78-119	73-119	73-116	53-130
Dibromomethane	87-117	83-120	80-116	61-123
Dichlorodifluoromethane	56-172	57-201	1-166	1-179
Ethylbenzene	82-119	82-129	82-115	40-143
Hexachlorobutadiene	56-120	52-132	57-122	5-151
Isopropylbenzene	80-120	81-130	79-117	48-138
m+p-Xylene	84-120	82-130	82-117	40-143
Methylene Chloride	80-128	79-133	81-121	59-135
Naphthalene	61-116	59-124	59-123	2-142
n-Butylbenzene	70-116	66-131	69-124	22-149
n-Propylbenzene	78-119	78-131	72-124	31-151
o-Xylene	84-120	82-130	82-117	40-143
p-Isopropyltoluene	72-118	72-128	74-120	33-144
sec-Butylbenzene	72-120	73-129	72-120	31-149
Styrene	84-117	76-126	79-116	46-137
tert-Butylbenzene	74-114	76-128	74-120	44-148
Tetrachloroethene	82-126	75-143	79-122	39-160
Toluene	85-115	83-127	81-116	45-142
trans-1,2-Dichloroethene	81-124	82-133	77-124	54-135
trans-1,3-Dichloropropene	79-114	75-117	72-119	51-127
Trichloroethene	87-117	75-135	81-114	47-140
Trichlorofluoromethane	59-137	67-163	45-133	26-149
Vinyl Chloride	71-129	70-151	48-135	23-154
Xylene (Total)	84-120	82-130	82-117	40-143
Allyl Chloride	40-136	45-143	39-144	29-140
2-Chloro-1,3-butadiene	71-142	74-151	72-128	51-135

Table B5-6 – Continued
Statistical Acceptance Limits for
Volatiles by GC/MS (8260B)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
trans-1,4-Dichloro-2-butene	50-140	36-143	55-134	36-143
1,2-Dichloroethene (Total)	84-117	83-126	83-118	57-131
1,4-Dioxane	41-155	30-153	56-131	26-160
Ethyl Methacrylate	77-118	74-120	70-121	36-140
Isobutyl Alcohol	59-134	51-140	40-144	29-155
Methacrylonitrile	79-124	70-124	70-131	56-133
Methyl Iodide	74-133	73-146	72-127	52-141
Methyl Methacrylate	73-113	68-117	63-122	39-139
Propionitrile	73-128	63-129	64-134	49-140
Vinyl Acetate	69-182	74-187	63-179	1-228

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-7
Quality Control
Semivolatiles by GC/MS (8270C)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates:			Each sample, MS, MSD, LCS, and blank	Repeat extraction and analysis; if reanalysis confirms originals, document on report and/or case narrative
Nitrobenzene-d_5	54-124	47-128		
2-Fluorobiphenyl	64-112	55-123		
Terphenyl-d_{14}	43-116	49-133		
Phenol-d_6	10-80	45-120		
2-Fluorophenol	23-94	41-119		
2,4,6-Tribromophenol	40-136	46-136		
Matrix Spikes: Spike all compounds of interest	See Table B5-8 for acceptance limits		Each group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Sample: Spike all compounds of interest	See Table B5-8 for acceptance limits		Each group (≤20) of samples per matrix/level	Re-extract and reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Same as for matrix spikes	≤30% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ for all compounds		Once per extraction group (≤20) of samples, each matrix/level	Re-extract and reanalyze blank and associated samples
Internal Standards: 1,4-Dichlorobenzene-d_4 Naphthalene-d_8 Acenaphthene-d_{10} Phenanthrene-d_{10} Chrysene-d_{12} Perylene-d_{12}	-50% to +100% of internal standard area of 12-hour STD RT change ≤30 sec.		Each sample, MS, MSD, LCS, and blank	Reanalyze samples; if reanalysis confirms original, document on report and/or case narrative

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

This criteria is for PPL, Appendix IX, and TCL lists.

Table B5-8
Statistical Acceptance Limits for
Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
1,2,4,5-Tetrachlorobenzene	58-110	34-124	67-117	33-141
1,2,4-Trichlorobenzene	49-107	53-113	72-102	37-132
1,2-Dichlorobenzene	45-103	49-106	64-101	41-115
1,2-Diphenylhydrazine	63-108	63-111	62-115	40-131
1,3,5-Trinitrobenzene	35-117	25-120	16-86	5-149
1,3-Dichlorobenzene	39-103	44-108	62-105	37-118
1,3-Dinitrobenzene	71-120	77-107	74-113	39-133
1,4-Dichlorobenzene	41-102	42-105	62-104	38-116
1,4-Naphthoquinone	10-187	25-52	25-102	25-188
1,4-Phenylenediamine	70-130	70-130	70-130	70-130
1-Naphthylamine	9-107	5-124	11-60	5-117
2,3,4,6-Tetrachlorophenol	65-129	46-132	74-117	2-172
2,4,5-Trichlorophenol	70-115	38-138	76-110	41-132
2,4,6-Trichlorophenol	71-109	31-140	75-106	41-132
2,4-Dichlorophenol	70-107	59-113	76-104	38-133
2,4-Dimethylphenol	60-107	39-123	68-103	44-131
2,4-Dinitrophenol	46-121	20-151	21-120	20-143
2,4-Dinitrotoluene	75-122	43-145	75-118	47-138
2,6-Dichlorophenol	70-112	73-108	70-113	22-135
2,6-Dinitrotoluene	71-108	47-128	75-108	52-124
2-Acetylaminofluorene	68-116	78-103	68-111	7-143
2-Chloronaphthalene	65-108	64-114	72-103	45-127
2-Chlorophenol	63-112	56-110	74-104	46-124
2-Methylnaphthalene	59-107	43-130	70-102	42-128
2-Methylphenol	56-105	34-119	68-103	42-125
2-Naphthylamine	5-104	5-91	5-27	5-102
2-Nitroaniline	74-114	69-127	76-117	47-137
2-Nitrophenol	71-113	32-146	76-111	42-133
2-Picoline	52-96	71-80	47-102	31-114
3- or 4-methylphenol	52-97	30-114	65-113	40-132
3,3'-Dichlorobenzidine	30-108	30-122	9-101	2-129
3,3'-Dimethylbenzidine	5-71	14-61	35-69	5-115
3-Methylcholanthrene	70-117	69-113	78-118	2-183
3-Nitroaniline	64-113	48-122	53-107	26-131
4,6-Dinitro-2-methylphenol	56-130	29-141	41-121	5-150

Table B5-8 – Continued
Statistical Acceptance Limits for
Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
4-Aminobiphenyl	7-72	2-83	5-72	5-132
4-Chloro-3-methylphenol	71-113	56-122	72-117	47-136
4-Chloroaniline	32-120	22-122	14-104	6-126
4-Chlorophenyl phenylether	67-109	64-109	70-108	52-122
4-Nitroaniline	56-107	55-103	48-96	27-133
4-Nitrophenol	19-76	10-95	55-133	14-172
4-Nitroquinoline-1-oxide	20-169	20-103	10-58	10-60
5-Nitro-o-toluidine	24-105	30-92	26-55	5-116
7,12-Dimethylbenz(a)anthracene	46-106	40-111	69-115	26-150
a,a-Dimethylphenethylamine	70-130	70-130	70-130	70-130
Acenaphthene	69-112	59-120	76-109	48-132
Acenaphthylene	52-117	27-134	66-113	46-128
Acetophenone	61-103	70-94	59-110	34-133
Aniline	35-102	33-102	40-95	1-153
Anthracene	69-108	60-117	71-107	35-138
Benzidine	20-104	20-125	20-90	20-101
Benzo(a)anthracene	74-113	72-108	74-107	26-144
Benzo(a)pyrene	74-116	77-110	79-113	23-154
Benzo(b)fluoranthene	71-116	72-109	71-113	32-140
Benzo(g,h,i)perylene	70-121	72-114	74-119	17-152
Benzo(k)fluoranthene	72-116	73-111	75-112	36-143
Benzyl alcohol	54-100	61-89	60-112	56-112
bis (2-Chloroethoxy)methane	74-120	75-116	75-114	50-136
bis(2-Chloroethyl)ether	59-109	33-131	66-104	40-132
bis(2-Chloroisopropyl)ether	59-133	59-145	67-137	53-136
bis(2-Ethylhexyl)phthalate	62-126	64-130	63-131	48-137
Butylbenzylphthalate	66-121	52-129	75-117	40-141
Chlorobenzilate	44-136	21-144	72-130	55-149
Chrysene	73-113	73-108	72-109	23-150
Diallate (cis/trans)	60-129	65-115	65-120	66-112
Dibenz(a,h)anthracene	76-128	81-118	80-125	19-163
Dibenzofuran	66-107	60-110	72-107	39-129
Diethylphthalate	61-110	35-124	75-109	53-128
Dimethoate	3-109	3-105	1-102	1-125
Dimethylphthalate	34-114	2-132	76-108	52-125

Table B5-8 – Continued
Statistical Acceptance Limits for
Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Di-*n*-butylphthalate	69-111	71-107	73-109	51-126
Di-*n*-octylphthalate	62-118	64-119	67-115	38-147
Ethylmethanesulfonate	63-108	77-99	68-105	39-121
Fluoranthene	69-107	70-104	69-107	19-145
Fluorene	61-116	52-121	66-115	39-137
Hexachlorobenzene	71-110	65-114	72-110	44-133
Hexachlorobutadiene	20-111	31-122	69-108	38-134
Hexachlorocyclopentadiene	12-119	5-130	9-154	5-140
Hexachloroethane	22-102	20-116	62-105	20-135
Hexachloropropene	21-126	34-119	49-122	2-179
Indeno(1,2,3-cd)pyrene	70-120	69-115	74-113	36-141
Isodrin	48-129	42-133	71-126	30-147
Isophorone	66-105	44-127	70-103	47-128
Isosafrole	60-103	69-96	69-96	45-114
Methapyrilene	3-31	3-35	2-44	2-118
Methylmethanesulfonate	30-87	35-86	35-108	1-126
Naphthalene	58-108	63-107	73-103	38-132
Nitrobenzene	63-112	43-133	70-106	39-137
n-Nitrosodiethylamine	64-110	80-99	66-103	5-147
n-Nitrosodimethylamine	39-84	40-88	59-114	26-131
n-Nitrosodi-*n*-butylamine	52-105	65-92	53-132	36-130
n-Nitrosodi-*n*-propylamine	59-107	61-110	62-109	46-127
n-Nitrosodiphenylamine	63-104	69-105	67-105	46-131
n-Nitrosomethylethylamine	56-113	76-92	63-106	15-139
n-Nitrosomorpholine	57-112	73-106	79-109	55-128
n-Nitrosopiperidine	70-110	82-100	73-106	57-118
n-Nitrosopyrrolidine	59-107	78-90	68-111	52-118
O,O,O-Triethylphosphorothioate	62-115	76-106	70-113	56-121
o-Toluidine	16-96	1-116	31-85	2-144
p-(Dimethylamino)azobenzene	42-122	60-109	10-123	2-151
Pentachlorobenzene	63-110	73-104	67-110	24-150
Pentachloronitrobenzene	74-119	74-113	69-129	33-146
Pentachlorophenol	50-112	20-130	47-110	5-138
Phenacetin	66-126	76-112	71-127	46-136
Phenanthrene	70-109	56-125	70-107	29-143

Table B5-8 – Continued
Statistical Acceptance Limits for
Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Phenol	24-65	12-87	67-108	30-137
Pronamide	71-114	73-109	72-112	14-157
Pyrene	69-116	67-112	71-110	28-144
Pyridine	31-88	31-88	33-101	16-110
Safrole	58-113	75-101	67-108	61-108
Tetraethyldithiopyrophosphate	62-128	64-119	67-120	48-151
Thionazin	67-115	71-111	69-109	66-120

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

All 70-130 windows are advisory due to insufficient data points.

Table B5-9
Quality Control
Volatiles Halocarbons and Aromatics by GC (8021B)

Type	Waters Acceptance Limits (%)	Frequency	Corrective Action
Surrogates: Halocarbons; 1-Bromo-4-chlorobenzene (ELCD)	73-124	Each sample, MS, MSD, LCS, and blank	Reanalyze if the surrogate recovery is outside the limits unless matrix related problems are evident
Aromatics; 1-Bromo-4-chlorobenzene (PID)	72-122		
Halocarbons/Aromatics; 1-Bromo-4-chlorobenzene (ELCD/PID)	See above		
Non-halogenated; 2-hexanone (FID)	81-121		
Matrix Spikes: Spike all compounds of interest	See Table B5-10 for acceptance limits	Each group of samples of similar matrix/level (≤20) each method	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples/Check Standards: Spike all compounds of interest	See Table B5-10 for acceptance limits	Each group (≤20); LCSD is analyzed if sufficient volume is not available for MS/MSD	Reanalyze LCS and associated samples for compounds outside of acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Internal Standards: Fluorobenzene (ELCD/PID)	80-120	Each sample, MS, MSD, LCS, and blank	Reanalyze samples; if reanalysis confirms original, document on report and/or case narrative; in cases where matrix is elevating the internal standard (ISTD) recovery, a dilution may be performed to bring the ISTD within specifications
Matrix Spike Duplicates (RPD): Same compounds as matrix spikes	≤30%	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ for all compounds	At least one per 20 samples and at least one per 24 hours	Reanalyze blank and associated samples if blank is outside limits

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-10
Statistical Acceptance Limits for
Volatiles Halocarbons and Aromatics by GC (8021B)

Compound Name	Waters	
	LCS/LCSD (%)	MS/MSD (%)
1,1,1-Trichloroethane	83-119	80-121
1,1,2,2-Tetrachloroethane	85-119	81-125
1,1,2-Trichloroethane	85-119	82-113
1,1-Dichloroethane	80-115	79-122
1,1-Dichloroethene	72-118	69-128
1,2-Dichlorobenzene	85-115	86-124
1,2-Dichloroethane	85-115	81-117
1,2-Dichloropropane	83-118	87-116
1,3-Dichlorobenzene	85-118	80-123
1,4-Dichlorobenzene	84-115	82-118
Benzene	84-115	78-119
Bromodichloromethane	80-119	74-118
Bromoform	85-124	75-127
Bromomethane	67-120	45-150
Carbon tetrachloride	83-119	74-121
Chlorobenzene	84-115	82-115
Chloroethane	66-136	70-139
Chloroform	81-115	81-119
Chloromethane	16-180	11-186
cis-1,2-Dichloroethene	81-115	68-126
cis-1,3-Dichloropropene	85-119	57-131
Dibromochloromethane	83-115	79-120
Dichlorodifluoromethane	32-140	29-155
Ethylbenzene	84-115	81-116
Methylene chloride	68-126	62-129
Tetrachloroethene	82-115	74-130
Toluene	83-115	80-114
trans-1,2-Dichloroethene	74-115	72-120
trans-1,3-Dichloropropene	85-115	74-125
Trichloroethene	81-115	74-122
Trichlorofluoromethane	59-125	58-138
Vinyl chloride	65-119	68-136
Xylene (total)	84-115	81-117

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-11
Quality Control
Petroleum Analysis by GC (8021B)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates: α,α,α-Trifluorotoluene (PID)	66-136	72-122	Each sample, MS, MSD, LCS, and blank	Reanalyze if the surrogate recovery is outside the limits unless matrix-related problems are evident
Matrix Spikes: Spike all compounds of interest	See Table B5-12		Each group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples: Spike all compounds of interest	See Table B5-12		Each group (≤20) of samples per matrix/level	Reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD):	≤30% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by an analyst in relationship to other QC results
Blanks:	≤LOQ for all compounds		At least one per 20 samples and at least one per 24 hours	Reanalyze blank and associated samples if blank is outside limits
Internal Standards: 1-Chloro-3-fluorobenzene (PID)	-50% to +150% if internal standard area		Each sample, MS, MSD, LCS, and blank analyzed on the PID	Reanalyze samples; if reanalysis confirms original, document on report or case narrative; in cases where matrix is elevating the ISTD recovery, a dilution may be performed to bring ISTD within specifications

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-12
Statistical Acceptance Limits for
Petroleum Analysis by GC (8021B)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Benzene	79-123	67-136	86-113	60-111
Ethylbenzene	81-119	75-133	89-112	66-110
MTBE	75-125	59-148	70-131	50-119
Naphthalene	44-139	39-150	70-125	53-122
Toluene	82-119	78-129	88-113	61-114
Total Xylenes	82-120	78-130	90-112	66-112

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-13
Quality Control
TPH-GRO by GC (8015B)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates: Trifluorotoluene (FID)	57-146	71-122	Each sample, MS, MSD, LCS, and blank	Reanalyze if the surrogate recovery is outside the limits unless matrix-related problems are evident
Matrix Spikes: Gasoline standard 8015B	63-154	39-118	Each group of samples of similar matrix/level (≤20) each method	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples: Gasoline standard	70-130	67-119	Each group (≤20) of samples. LCSD analyzed if sufficient volume is not available for MS/MSD.	Reanalyze LCS and associated samples. LCS that fails high, and GRO is ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Same compounds as matrix spikes	≤30% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ		At least one per 20 samples and at least one per 24 hours	Reanalyze blank and associated samples if blank is outside limits

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-14
Quality Control
TPH-DRO by GC (8015B)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates: o-Terphenyl	54-127	60-131	Added to each sample, MS/MSD, blank, and LCS/LCSD during the extraction phase	Repeat extraction and analysis; if reanalysis confirms original result, report results and comment in case narrative
Matrix Spikes: #2 Fuel Oil 8015B API California	41-145	37-153	Each group (≤20) of samples per matrix/level	Reinject if surrogates appear low. If still out of spec, evaluate for matrix effect. If matrix effect, accept based on LCS data. If no matrix effect, repeat batch.
Laboratory Control Samples: No. 2 Fuel	53-126	74-118	Each group ≤20	Reinject if surrogates appear low. If still out of spec, repeat batch. LCS that fails high, and DRO is ND in the sample, can be reported.
Laboratory Control Duplicates (RPD): #2 Fuel	≤20% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ		Once per case or extraction group (≤20) of samples, each matrix, level, instrument	Inject a solvent blank first to be sure the analytical system is clean then reinject the blank itself. If the reinjected blank is acceptable, any samples extracted with this blank should be reinjected, if they, too, contain the analyte that was contaminating the blank. If the reinjected blank is unacceptable, any affected samples must be re-extracted.

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-15
Quality Control
Organochlorine Pesticides/PCBs (8081A/8082)
Herbicides (8151A)
Organophosphate Pesticides (8141A)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates:			Added to each sample, MS/MSD, blank, LCS/LCSD during the extraction phase	Repeat extraction and analysis; if reanalysis confirms original result, report results and comment in case narrative
Organochlorine Pesticides:				
DCB	47-155	62-159		
TCX	45-125	58-149		
Herbicides:				
DCAA	31-137	31-137		
Organophosphate Pesticides:				
2NMX	46-117	69-118		
Matrix Spikes: Organochlorine Pesticides (for 8081A/8082) (spike all compounds of interest, except PCBs, chlordane, and toxaphene); Herbicides (spike all compounds of interest); Organophosphate Pesticides (spike all compounds of interest); PCBs (for 8082 only) Aroclor 1016 Aroclor 1260	See Table B5-16 through B5-18 for acceptance limits		Each extraction group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.

Table B5-15 – Continued
Quality Control
Organochlorine Pesticides/PCBs (8081A/8082)
Herbicides (8151A)
Organophosphate Pesticides (8141A)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Laboratory Control Samples: Organochlorine Pesticides (for 8081A/8082) (spike all compounds of interest, except PCBs, chlordane, and toxaphene); Herbicides (spike all compounds of interest); Organophosphate Pesticides (spike all compounds of interest); PCBs (for 8082 only) Aroclor 1016 Aroclor 1260	See Table B5-16 through B5-18 for acceptance limits		Each group (≤20) when MS/MSD falls outside established limits	Re-extract and reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.

Table B5-15 – Continued
Quality Control
Organochlorine Pesticides/PCBs (8081A/8082)
Herbicides (8151A)
Organophosphate Pesticides (8141A)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Matrix Spike Duplicates (RPD): Organochlorine Pesticides (for 8081A/8082) (spike all compounds of interest, except PCBs, chlordane, and toxaphene); Herbicides (spike all compounds of interest); Organophosphate Pesticides (spike all compounds of interest); PCBs (for 8082 only) Aroclor 1016 Aroclor 1260	≤30%	≤50%	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ		Once per extraction group (≤20) of samples, each matrix, level, instrument	Inject a hexane or solvent blank first to be sure the analytical system is clean then reinject the blank itself. If the reinjected blank is acceptable, any samples extracted with this blank should be reinjected if they too, contain the analyte that was contaminating the blank. If the reinjected blank is unacceptable, any affected samples must be re-extracted.

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-16
Statistical Acceptance Limits for
Organochlorine Pesticides/PCBs (8081A/8082)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
4,4-DDD	42-155	69-155	71-143	52-181
4,4-DDE	44-154	59-159	71-143	48-175
4,4-DDT	47-159	56-145	67-152	62-166
Aldrin	47-122	44-122	74-137	58-159
alpha-BHC	56-122	61-137	70-134	64-134
alpha-Chlordane	62-135	60-126	76-133	46-163
beta-BHC	64-143	44-160	68-137	31-176
Chlordane	N/A	N/A	N/A	N/A
delta-BHC	41-155	60-161	53-167	68-158
Dieldrin	71-129	57-137	71-133	68-139
Endosulfan I	66-131	54-141	71-130	41-166
Endosulfan II	61-141	71-141	73-134	65-144
Endosulfan sulfate	56-140	46-154	58-133	65-154
Endrin	62-135	44-152	74-142	58-171
Endrin aldehyde	36-158	53-149	47-145	63-125
Endrin Ketone	61-139	72-139	70-143	33-173
gamma-BHC (Lindane)	65-144	49-136	74-133	43-154
gamma-Chlordane	52-153	68-143	63-145	30-157
Heptachlor	45-130	37-145	72-143	70-138
Heptachlor epoxide	73-141	45-143	72-132	69-133
Kepone	N/A	N/A	N/A	N/A
Lindane	65-144	49-136	74-138	43-154
Methoxychlor	49-155	47-170	52-174	74-162
PCB-1016	52-123	66-115	72-120	45-125
PCB-1221	N/A	N/A	N/A	N/A
PCB-1232	N/A	N/A	N/A	N/A
PCB-1242	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A
PCB-1260	62-133	75-114	76-122	32-139
Toxaphene	N/A	N/A	N/A	N/A

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-17
Statistical Acceptance Limits for
Organophosphate Pesticides (8141A)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Bolstar	73-130	52-144	68-122	59-140
Coumaphos	60-141	45-141	44-167	18-210
Demeton-O	29-91	28-97	34-94	22-122
Demeton-S	53-176	85-191	63-170	41-214
Diazinon	68-142	59-176	68-146	60-148
Dichlorvos	29-174	83-165	46-227	46-227
Disulfoton	71-123	71-141	51-127	54-130
Dursban (Chlorpyrifos)	72-127	66-148	53-156	74-149
EPN	65-129	48-134	54-140	48-162
Ethion	66-133	74-121	57-153	57-157
Ethoprop	55-144	75-127	65-141	76-134
Ethyl parathion	68-125	58-157	58-145	34-181
Famphur	49-139	34-151	60-153	45-199
Fensulfothion	13-124	56-140	61-200	74-143
Fenthion	59-138	68-133	68-149	66-137
Guthion (Azinphos-methyl)	43-159	28-159	36-174	47-130
Malathion	78-130	46-150	64-157	39-176
Merphos	30-170	54-152	38-190	1-238
Methyl parathion	53-142	51-152	56-141	63-147
Mevinphos	30-133	63-140	55-176	25-231
Naled	11-129	24-183	19-175	19-170
Phorate	71-127	44-163	61-134	65-130
Ronnel	63-133	76-128	62-133	67-135
Stirophos	43-149	68-143	49-164	31-228
Tokuthion	79-131	86-124	66-142	51-168
Trichloronate	71-125	77-120	56-131	63-129
Trithion	73-122	69-138	57-160	55-173

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-18
Statistical Acceptance Limits for
Herbicides (8151A)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
2,4,5-T	55-134	48-180	50-159	13-189
2,4,5-TP	65-130	44-161	57-135	30-151
2,4-D	55-123	38-176	63-132	41-158
2,4-DB	41-163	59-123	57-139	72-168
2,4-DP (Dichlorprop)	76-127	74-123	68-126	59-136
Dalapon	31-113	32-98	18-82	12-86
Dicamba	59-134	61-144	56-125	52-126
Dinoseb	19-96	1-119	1-36	1-48
MCPA	61-127	48-157	67-122	48-145
MCPP	67-119	43-159	59-123	33-123
Pentachlorophenol	48-112	41-105	47-109	20-117

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-19
Quality Control
PAHs by HPLC (8310)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates: Nitrobenzene or Triphenylene	63-154 59-131	59-121 48-161	Added to each sample, MS/MSD, blank, LCS/LCSD during the extraction phase	Surrogate must be within the limits unless matrix related problems are evident. If matrix related problems are evident, comment on report and in case narrative.
Matrix Spikes: Spike all compounds of interest	See Table B5-20		Each group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples: Spike all compounds of interest	See Table B5-20		Each group (≤20) of samples per matrix/level	Re-extract and reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Spike all compounds of interest	≤30%	≤50%	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relation to other QC results
Blanks:	≤LOQ		Once per extraction group (≤20) of samples, each matrix/level	Inject a hexane or solvent blank first, to be sure the analytical system is clean then reinject the blank itself. If the reinjected blank is acceptable, any samples extracted with this blank should be reinjected, if they contain the analyte, which was present in the blank. If the reinjected blank is unacceptable, any affected samples must be re-extracted.

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-20
Statistical Acceptance Limits for
PAHs by HPLC (8310)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Acenaphthene	60-116	59-114	72-115	54-125
Acenaphthylene	56-115	63-104	66-110	49-123
Anthracene	68-113	72-112	68-117	1-158
Benzo(a)anthracene	73-114	78-112	72-115	28-54
Benzo(a)pyrene	68-112	68-125	68-116	45-139
Benzo(b)fluoranthene	72-113	70-119	74-118	47-122
Benzo(g,h,i)perylene	7-128	54-122	73-116	34-123
Benzo(k)fluoranthene	72-119	68-121	71-119	62-108
Chrysene	70-111	76-111	71-108	5-141
Dibenz(a,h)anthracene	19-129	59-128	76-126	57-113
Fluoranthene	70-112	85-115	73-107	50-112
Fluorene	61-116	73-102	71-106	54-121
Indeno(1,2,3-cd)pyrene	56-137	58-130	76-127	31-147
Naphthalene	57-109	54-112	61-120	50-123
Phenanthrene	67-115	66-115	73-112	65-115
Pyrene	69-113	79-106	67-117	3-143

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

B6. Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Conditions of the laboratory equipment and instrumentation can have a marked effect on the accuracy and precision of analysis. In order to ensure timely production of data and prevent/address potential malfunctions, Lancaster Laboratories schedules routine preventive maintenance of instruments based on manufacturer's recommendations. Maintenance of the laboratory instruments is the responsibility of the technical group using the equipment in conjunction with our in-house Equipment Maintenance Group. A schedule of routinely performed instrument maintenance tasks is attached as Table B6-1. All preventive maintenance, as well as maintenance performed as corrective action, is recorded in instrument logs. Equipment/Instrumentation is assigned unique designations to allow tracking of the piece of equipment within laboratory documentation. This allows the laboratory to substantiate the instrument condition during the time it was used for testing.

Critical spare parts are kept in supply at the laboratory by the Equipment Maintenance Group. Most items not kept in stock at the laboratory are available through overnight delivery from the manufacturer. In addition, Lancaster Labs maintains multiple numbers of most of the critical instruments used in our laboratory operations. A recent equipment inventory may be found in the *Environmental Quality Policy Manual.* Because we are a large laboratory with redundant capacity, the problems of instrument downtime are minimized.

Table B6-1
Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
GC/MS	Change septum	AN*: Min. weekly
	Clean/replace injection port seal and liner	AN
	Check fans	Monthly
	Check cool flow	Monthly
	Clean source	Bimonthly or AN
	Change oil in diffusion pump	Annually
	Change oil in rough pump	Annually
GC Volatiles	Check propanol level in ELCD resevoir	AN: Min. semiweekly
	Check all liquid and gas flows	Prior to calib. or AN
	Clean ELCD cell, change reaction tube	AN
	Change ELCD, Teflon line, and resin tube	AN
	Replace absorbant trap in concentrators	AN
	Column maintenance	AN
	Change PID lamp	AN
	Precalibration instrument settings check	Prior to each calibration
GC	Septum change	Each run
	Column/injection port maintenance	AN
	Clean detector	AN
	Vacuum filters	Semiannually
	Leak check ECDs	Semiannually
GFAA	Inspect/clean furnace head and lenses	Daily
	Check rinse bottle & drain	Daily
	Clean windows	Weekly
	Clean air intakes	Monthly
	Check Cool-Flow water level	Monthly
	Inspect sample introduction capillary	AN
	Inspect graphite tube	AN
	Adjust/replace electrodes/shroud	AN
	Clean Cool-Flow	AN
Cold Vapor AA	Replace pump tubing	AN: Min. weekly
	Lubricate pump head and autosampler	AN
	Inspect optical cell and windows	Monthly

Table B6-1 – Continued
Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
ICP	Replace pump winding	AN
	Lubricate autosampler	AN
	Check tubing to torch	AN
	Vacuum instrument airfilters and air intakes	AN
	Check water filter, replace if needed	Quarterly
	Change vacuum pump oil	Quarterly
	Clean optics and lenses	Semiannually
	Clean Torch and injector tip	AN
	Clean nebulizer and spray chamber	AN
	Check fan filters, clean if needed	AN
	Check cool flow, clean if needed	AN
Infrared Spectrometer (FTIR)	Check on-demand diagnostics	Weekly
	Change dessicant	AN
HPLC	Pump lubrication	Annually
	Check pump seals	Annually
	Check valves cleaned or rebuilt	AN
	Replace and/or adjust detector bulb	AN
	Clean detector flow cell	AN
	Replace Teflon lines	AN
	Autosampler septa replacement	AN
	In-line filter sonication/cleaning	AN
	System passivation	AN
	PCRS pump lubrication	AN
	Empty waste liquid resevoir	Daily
ICP/MS	Change interface rough pump oil	Quarterly
	Change MS rough pump oil	Semiannually
	Clean cones and ion lenses	AN
	Clean torch, injector tip, nebulizer, and spray chamber	AN
	Change peristalic tubing	Weekly
	Vacuum instrument airfilters and air intakes	AN
	Empty waste liquid resevoir	Daily

Table B6-1 – Continued
Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
Total Organic Carbon Analyzer	Check IR zero and IR cell	AN
	Check for leaks	AN
	Check acid pump calibration	Bimonthly
	Check persulfate pump calibration	Bimonthly
	Inspect 6-port rotary valve	AN
	Inspect sample pump head	AN
	Wash molecular sieve	AN
	Check sample loop calibration	Monthly
	Clean gas permeation tube	AN
	Inspect digestion vessel O-rings	AN
	Check activated carbon scrubber	AN
	Dust back and clean circuit boards	AN
Total Organic Halogen Analyzer	Polish counter electrode	Daily
	Polish sensor electrode	Daily
	Clean loaders and pistons	Weekly
Autoanalyzer spectrophotometer	Clean sample probe	AN
	Clean proportioning pump	AN
	Inspect pump tubing, replace if worn	AN
	Clean wash receptacles	Monthly

* AN means as needed. Any of these items may be performed more frequently if response during operation indicates this is necessary.

B7. Instrument Calibration and Frequency

All measuring and testing equipment having an effect on the accuracy or validity of calibrations and tests will be calibrated and/or verified on an on-going and routine basis. Procedures for initial calibration and continuing calibration verification are in place for all instruments within the laboratory. The calibrations generally involve checking instrument response to standards (standardization) for each target compound to be analyzed. The source and accuracy of standards used for this purpose are integral to obtaining the best quality data. Standards used at Lancaster Laboratories are purchased from commercial supply houses either as neat compounds or as solutions with certified concentrations. The accuracy and quality of these purchased standards is verified through documentation provided by these commercial sources. Most solutions and all neat materials require subsequent dilution to an appropriate working range. All dilutions performed are documented and the resulting solution is checked by obtaining the instrument response of the new solution and comparing with the response to the solution currently in use. Any discrepancies between the responses are investigated and resolved before the new solution is used. Each standard is assigned a code that allows traceability to the original components. The standard container is marked with the code, name of solution, concentration, date prepared, expiration date, and the initials of the preparer. Shelf life and storage conditions for standards are included in the standard operating procedures and old standards are replaced before their expiration date.

Each instrument is calibrated with a given frequency using one or more concentrations of the standard solution. As analysis proceeds, the calibration is checked for any unacceptable change in instrument response. If the calibration check verifies the initial response, the analysis proceeds. If the calibration check indicates that a significant change in instrument response has occurred, then a new calibration is initiated. If necessary, maintenance may be performed before the recalibration.

Some instrumentation calibration involves the comparison of an instrument reading to a physical standard with a known certified value such as balance/weights or comparison against other instrumentation/apparatus such as NIST thermometer.

Calibration records are usually kept in the form of raw data with the other instrument printouts. In cases where no data system is used, calibration data is manually recorded in notebooks. Any maintenance or repair is also recorded in a notebook. The information that is recorded either in the notebooks or on the instrument printout includes the date, instrument ID, employee name and/or identification number, and concentration or code number of standard.

The frequency of calibration and calibration verification, number of concentrations analyzed, and acceptance criteria for each of the instruments to be used are listed in Table B7-1. In addition to checking the instrument response to target compounds, the GC/MS units are checked to ensure that standard mass spectral abundance criteria are met. Before each calibration, instruments used for volatile compound analysis are tuned using bromofluorobenzene (BFB) and instruments used for semivolatile analysis are tuned using decafluorotriphenylphosphine (DFTPP). The key ions and their abundance criteria are listed in Table B7-2.

Table B7-1
Instrument Calibration and Frequency

	Initial Calibration			Continuing Calibration Verification		
Instrument	Frequency	# Std Conc.	Acceptance Criteria	Frequency	# Std Conc.	Acceptance Criteria
GC/MS Volatiles*	After C-cal fails	6	RF for SPCCs >0.300 for chlorobenzene, and 1,1,2,2-tetrachloroethane, and >0.100 for 1,1-dichloroethene, bromoform, and chloromethane CCCs ≤30%	Every 12 hours	1	RF for SPCCs >0.300 for chlorobenzene, and 1,1,2,2-tetrachloroethane, and >0.100 for 1,1-dichloroethene, bromoform, and chloromethane %Drift for CCCs ≤20
GC/MS Semivolatiles*	After C-cal fails	6	RF for SPCCs ≥0.050 %RSD for CCCs ≤30%	Every 12 hours	1	RF for SPCCs ≥0.050 %Drift for CCCs ≤20
GC VOA Halocarbons and/or Aromatics	After C-cal fails	At least 5	%RSD of <20% for individual compounds or for average of all compounds	Every 12 hours, or every 10 samples	1	%Drift ±15% for individual compounds or average of all compounds
GC Pesticides and Herbicides (DDT/Endrin degradation applies to method 8081A only)	Each new run After C-cal fails	5	≤20% RSD of RFs of initial calibration to use avg. RF, otherwise use curve fit. Degradation for DDT, endrin 15%. Alternatively, if the average of the %RSDs of all compounds in the calibration standard is ≤20%, then the AVG RF can be used for all compounds.	Every 10 samples Every 20 samples or 12 hours for method 8081A, 8082	1	≤15% difference for individual analytes, from initial response for quantitation or A CCV is also compliant if the average RPD for all compounds in the CCV standard is ≤15%. DDT/Endrin degradation check every 12 hours or 20 injections
HPLC PAHs	Each new run or after C-cal fails	5	≤20% RSD of RFs of initial calibration to use average RF, otherwise use curve fit. Alternatively, if the average of the %RSDs of all compounds in the calibration standard is ≤20%, then the AVG RF can be used for all compounds.	Every 10 samples	1	≤15% difference for individual analytes, from initial response for quantitation or A CCV is also compliant if the average RPD for all compounds in the CCV standard is ≤15%.
GC TPH-GRO	After C-cal fails	At least 5	%RSD of <20% otherwise use calibration curve	Every 12 hours or every 10 samples	1	%Drift ±15%
GC TPH-DRO	After C-cal fails	5	% RSD of <20% for average RF otherwise use calibration curve	Every 10 samples	1	%Drift ±15%

Table B7-1 – Continued
Instrument Calibration and Frequency

	Initial Calibration			Continuing Calibration Verification		
ICP	Each new run	1	Independent calibration verification (ICV) within ±10%, standards <5%RSD	Every 10 samples	1	Same as initial
ICP-MS	Each new run	3	Independent calibration verification (ICV) within ±10% Corr. coeff. ≥0.995	Every 10 samples	1	±10% of true value
CVAA	Each new run	5	Independent calibration verification within ±10% Corr. coeff. >0.995	Every 10 samples	1	±20% of true value
GFAA	Each new run	5	Independent calibration verification within ±10% Corr. coeff. >0.995	Every 10 samples	1	±20% of true value
TOC Analyzer (w) Inst #1 (w) Inst #2 (s) Inst #3	Weekly	 1 5 4	 ±10% @ STD Corr. coeff. >0.995 Corr. coeff. >0.995	Every 10 samples	1	±10% of true value
Autoanalyzer	Daily	6	Corr. coeff. >0.995	Every 10 samples	1	±10% of true value
Infrared Spectrophotometer (FTIR)	Monthly	7	Corr. coeff. >0.995	Every 10 samples	1	±10% of true value
TOX Analyzer	Each batch	4	±5% @ STD	Every 8 samples	1	±10% of true value
Balance	Daily	4	Top-loading balance ±.5% Analytical balances ± .1% for weights >.1 g .05 g ± .5% .02 g ± 1.0% .01 g ± 2.0% .005 g ± 2.0%	N/A	N/A	N/A

*All compounds with %RSD >15 must use first or second order regression fit of the six calibration points. Alternatively, the AVG RF can be used for each compound.

Abbreviations

Std Conc. – The number of standard concentrations used
SPCCs – System performance check compounds
CCCs – Calibration check compounds
RF – Response factor
%RSD – Percent relative standard deviation
CCV – Continuing calibration verification
CVAA – Cold vapor atomic absorption spectrophotometer
HPLC – High Performance Liquid Chromatography
ICP – Inductively coupled plasma spectrophotometer; ICP run also includes interelement correction check standard (beginning and end of run)
GFAA – Graphite furnace atomic absorption spectrophotometer

Table B7-2
Mass and Ion Abundance Criteria

BFB Key Ions	Abundance Criteria
50	15% to 40% of mass 95
75	30% to 60% of mass 95
95	Base peak, 100% relative abundance
96	5% to 9% of mass 95
173	Less than 2% of mass 174
174	Greater than 50% of mass 95
175	5% to 9% of mass 174
176	Greater than 95% but less than 101% of mass 174
177	5% to 9% of mass 176
DFTPP Key Ions	Abundance Criteria
51	30% to 60% of mass 198
68	Less than 2% of mass 69
70	Less than 2% of mass 69
127	40% to 60% of mass 198
197	Less than 1% of mass 198
198	Base peak, 100% relative abundance
199	5% to 9% of mass 198
275	10% to 30% of mass 198
365	Greater than 1% of mass 198
441	Present but less than mass 443
442	Greater than 40% of mass 198
443	17% to 23% of mass 442

B8. Inspection/Acceptance Requirements for Supplies and Consumables

Analytical results can be affected by the type and quality of reagents, standards, and equipment. Time and effort could be lost if the reagents, standards, and equipment do not meet the specifications required for the method. Therefore, the specifications and/or requirements for reagents, standards, and equipment necessary to perform the testing methods are included in the analytical SOPs. Each technical department evaluates the reagents, standards and equipment they receive for acceptance and use in specific procedures. There are SOPs in place for procurement of supplies, and acceptance/evaluation of reagents and standards.

Sample bottles and vials provided to clients are purchased pre-cleaned to meet EPA specifications and guidelines for sample containers. Each lot of preservative purchased is analyzed for quality (signs of contamination) before being added to a sample container.

The deionized water system utilized by Lancaster Laboratories generates water meeting ASTM D1193-99, Type II water criteria and the USEPA Manual for the Certification of Laboratories Analyzing Drinking Water requirements. Appropriate testing is performed to monitor the system. The requirements for the DI system are documented in a laboratory SOP.

B9. Data Acquisition Requirements (Non-Direct Measurements)

The data acquired from the analytical procedures will be assessed for precision, accuracy, representativeness, comparability, and completeness (PARCCs). These specifications will be met through precision and accuracy criteria as specified in Element B5 and MDLs as specified in Element B4.

Precision – Precision is determined by measuring the agreement among individual measurements of the same property, under similar conditions. The laboratory objective is to equal or exceed the precision demonstrated for the applied analytical method on comparable samples. The degree of agreement is expressed as the relative percent difference (RPD%). Evaluation of the RPD% is based on statistical evaluation of past lab data or guidelines within the methods for organic and inorganic analyses. External evaluation of precision is accomplished by analysis of standard reference material and interlaboratory performance data.

Accuracy – Accuracy is a measure of the closeness of an individual measurement to the true or expected value. Analyzing a reference material of known concentration or reanalyzing a sample which has been spiked with a known concentration/amount is a way to determine accuracy. Accuracy is expressed as a percent recovery (%R). Evaluation of the %R is based on statistical evaluation of past lab data or guidelines within the methods for organic and inorganic analyses.

Representativeness – Representativeness expresses the degree to which data accurately represents the media and conditions being measured. The representativeness of the data from the sampling site will depend on the sampling procedure. Sample collection is the responsibility of the client. Samples will be homogenized, if required, as part of the laboratory sample preparation. By comparing the quality control data for the samples against other data for similar samples analyzed at the same time, representativeness can be determined for this objective.

Comparability – Comparability conveys the confidence with which one set of data can be compared to another. The analytical results can be compared to other laboratories by using traceable standards, standard methodology, and consistent reporting units. The Laboratory Quality Assurance Program documents internal performance, and the interlaboratory studies document performance compared to other laboratories.

Completeness – Completeness is a measure of the quantity of valid data acquired from a measurement process compared to the amount that was expected to be acquired under the measurement conditions. The completeness of an analysis can be documented by including in the data deliverables sufficient information to allow the data user to assess the quality of the results. Additional information will be stored in the laboratory's archives, both hard copy and magnetic tape. SOPs are in place to provide traceability of all reported results.

Uncertainty – (ISO 17025) "All uncertainty components which are of importance in a given situation shall be taken into account using appropriate methods of analysis." (5.4.6.3) This means the laboratory must determine the uncertainty contribution of all steps in the testing process such as equipment, calibration, standards, reagents, preparation, cleanups, etc. Since, in most methods, the laboratory control sample (LCS) goes through the entire process of preparation to analysis; all factors that would contribute to uncertainty will be evident through the LCS results. LCS are performed with every batch of samples where appropriate for the method.

B10. Data Management

At a minimum, data management is initiated when Lancaster Laboratories receives the samples from the client. In many instances, client-communicated requirements for bottleware and analyses are documented on an Incoming Sample Activity Report (ISAR) prior to sample receipt. This communication helps ensure that analysis and reporting meet the client needs. Sample information and requested analyses are entered into the Laboratory Information Management System (LIMS) where it can be accessed by all laboratory personnel. The entry is based on the ISAR and the client's COC. After entry, labels are printed for each container and an Acknowledgement is printed for the client. This will show exactly what was entered for the client's samples.

The flow of data from the time the samples enter the laboratory until the data is reported is summarized in Table B10-1. Raw analytical data generated in the laboratories is collected on printouts from the instruments and associated data system or manually in bound notebooks. All data is tracked by a unique seven-digit sample number assignment. Analysts review data as it is generated to determine that the instruments and methods are performing within specifications. This review includes calibration checks, surrogate recoveries, blank checks, retention time reproducibility, and other QC checks described in Elements B4, B5, and B7. If any problems are noted during the analytical run and/or at completion, corrective action is taken and documented.

Any data recorded manually is collected in bound notebooks and recorded in indelible ink, as described in Element A9. Procedures are in place for handling erroneous entries and all changes are dated, initialed, and explained. All data is uploaded automatically or manually entered into the LIMS. The LIMS is programmed to accept and track the results of quality control samples including blanks, surrogates, recoveries, duplicates, controls, and reference materials. The LIMS is programmed with the acceptance criteria for each QC type and if results are outside specifications, then a message is displayed to the analyst.

Data obtained from instrument printouts are dated and contain the signature and/or identification of the analyst responsible for the generation. The LIMS also produces control charts and statistics, which are reviewed by QA staff for trends that may indicate problems with the analytical data.

Computer technology is an integral part of laboratory operations including analytical instrumentation and central corporate functions. The laboratory makes extensive use of computers for business applications, technical operations, and the QA program. The Information Technology (IT) group support hardware and software applications at all levels as their primary function. Although some commercial software has been adapted to the laboratory operation, a larger portion is custom programmed by the IT group. The System Development Life Cycle (SDLC) approach is utilized and hardware and software are evaluated for appropriate functionality, accuracy, and security. Changes to systems and testing are documented. As part of QA's routine traceability audits, the electronic records are reviewed.

The principal criteria used to validate data will be the acceptance criteria described in Elements B4, B5, and B7 and protocols specified in laboratory SOPs. Following review, interpretation, and data reduction by the analyst, data is transferred to the LIMS by direct data upload from the analytical data system or manually. This system stores client information, sample results, and QC results. Element D1 describes the data deliverables validation performed by the laboratory.

Project files are created per client/project and contain chain-of-custody records, analysis requirements, and laboratory acknowledgments that document samples received, laboratory sample number assignment, and analyses requested. Raw data is filed per batch number assignment and laboratory sample number that correlates to the sample receipt documents. When the project is complete, all documentation is archived for 10 years in a locked storage area.

Table B10-1
Sample and Data Flow

Action	Personnel Involved
Sample received at Lancaster Labs • Unpacked and reconciled against the client paper work or Chain of Custody • SA Documentation log completed	Sample Administration
Sample is entered into sample management system • Lab ID number assigned • Analyses entered • Chain of custody started • Storage location assigned • Electronic record of sample number • Labels generated • Acknowledgement printed (record of samples received and analysis entered)	Sample Administration
Sample stored in assigned location (refrigerator, freezer, etc.) • Electronic record of sample #, bottle code, and location	Sample Support
Acknowledgment sent to client	Sample Administration
Sample removed from storage for analysis • Electronic requisition of sample number by bottle code • Necessary aliquot taken • Sample returned to storage	Technical Personnel
Analysis is performed according to selected analytical method • Raw data recorded • Reviewed • Transferred to computer by chemist or technician* (this is tracked by the unique sample number and batch number.)	Technical Personnel
Computer performs calculations as programmed according to methods	Data Processing
Second chemist or supervisor verifies raw data vs. LIMS entry	Technical Personnel
Analytical reports are printed and reviewed prior to sending to the client	Billing and Reporting staff and Technical Personnel
Data package deliverables are assembled	Data Package Group
Data packages are reviewed prior to sending to client	QA, Data Package Personnel, and Laboratory Management
Data packages are scanned, creating Adobe Acrobat PDF files, which can be e-mailed or stored on a CD-ROM and sent to the client Hard copy of batch raw data is archived Electronic files are backed up and archived	Data Package Personnel, Office Services, Technical Personnel

* Analyses requiring the chemist's interpretation may involve manual data reduction before entry into the computer.

Each analytical run is reviewed by a chemist for completeness and accuracy before interpretation and data reduction. The following calculations are used to reduce raw data to reportable results.

Semivolatiles and Volatiles by GC/MS Calculations:

GC/MS calculation used by the data system to determine concentration in extract for semivolatiles or in the sample itself for volatiles:

$$Q = \frac{(A_x)\,(I_s)}{(A_{is})\,(RRF)\,(V_i)}$$

Where:

- Q = Concentration determined by the data system (mg/L)
- A_x = Peak area
- A_{is} = Internal standard peak area
- I_s = Amount of internal standard injected (ng)
- RRF = Relative response factor
- V_i = Volume of extract injected (L) or volume sample purged (mL)

The extract concentration is further reduced by considering the initial sample weight or volume and the final extract volume:

$$\textit{Sample Concentration} = \frac{(Q)\,(D)\,(F)\,(1000)}{IV\ (or\ IW)}$$

Where:

- Q = Concentration determined by the data system (mg/L)
- D = Dilution factor if needed
- F = Final extract volume (mL)
- IW = Initial sample weight (g)
- IV = Initial sample volume (mL)

Results are reported in µg/L for water samples and µg/kg for solid samples. Soil samples are reported on a dry-weight basis. The results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

Volatiles by GC and Petroleum Analysis Calculations:

For volatiles by GC and petroleum analysis, a calibration is performed with a minimum of five levels using either an internal standard calibration or external calibration.

A. Internal standard calibration

$$CF = \frac{(A_x)(C_{is})}{(A_{is})(C_x)} \text{ or } CF = \frac{(H_x)(C_{is})}{(H_{is})(C_x)}$$

Where:

A_x = Peak area of the compound to be measured in that level of the initial calibration

H_x = Height area of the compound to be measured in that level of the initial calibration

A_{is} = Peak area of the internal standard

H_{is} = Height are of the internal standard

C_{is} = Concentration of the internal standard

C_x = Concentration of the compound spiked into that level

$$\overline{CF} = \frac{\Sigma \text{ all CF in the initial calibration}}{n}$$

Where:

n = Number of levels in the initial calibration

$$Concentration = \frac{(A_x)(C_{is})}{(A_{is})(\overline{CF})} \times DF \text{ or } \frac{(H_x)(C_{is})}{(H_{is})(\overline{CF})} \times DF$$

Where:

A_x = Peak area of the compound to be measured
H_x = Height area of the compound to be measured
A_{is} = Peak area of the internal standard
H_{is} = Height area of the internal standard
C_{is} = Concentration of the internal standard.
$\overline{CF}$ = Average calibration factor
DF = Dilution factor or preparation factor

B. External calibration

$$Concentration = \frac{A_x}{\overline{CF}} \times DF \text{ or } \frac{H_x}{\overline{CF}} \times DF$$

Where all parameters are defined in A above.

Results are reported in µg/L for water samples and mg/kg for solid samples. Soil samples are reported on a dry-weight basis. Results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

Herbicides and Organophosphate Pesticides:

For herbicides and organophosphate pesticides, an internal standard calibration is used. The results are calculated from the average response factor when the individual analyte %RSD is ≤20% or when the average of all analyte %RSDs is ≤20%. Otherwise, the results are calculated using the curve.

A. Curve

$$Sample\ Concentration,\ \mu g/kg\ or\ \mu g/L = Extract\ Concentration \times \frac{DF \times FV \times AF}{IW\ (or\ IV)}$$

Where:

Extract Concentration = (peak ht. – y-intercept)/slope
FV = Final volume
IW = Initial weight (g)
IV = Initial volume (mL)
DF = Dilution Factor
AF = Additional preparation factors

B. Average response factor

$$Extract\ Conc.,\ mg/L = \frac{Pk\ Ht\ in\ sample}{ARF} \times \frac{Int\ std\ ht\ in\ L3\ std}{Int\ std\ ht\ in\ sample}$$

Where:

ARF = Average Response Factor [(RF Calib1 + ... + RF Calib 5)/5]
RF = Peak height/conc. in standard

Results are reported as µg/L for water samples and µg/kg for solid samples. Soil samples are reported on a dry-weight basis. Results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

PAHs by HPLC and Pesticide/PCB Calculations:

The results for the PAHs by HPLC and pesticide/PCBs analyses are calculated using external standard. The pesticides/PCBs results are calculated from the average response factor when the individual analyte %RSD is ≤20% or when the average of all analyte %RSDs is ≤20%. Otherwise, the results are calculated using the curve.

$$\frac{Pk\ Ht \times FV \times DF \times AF}{ARF \times IV\ (or\ IW)} = Concentration\ (mg/L\ or\ \mu g/kg)$$

Where:

Pk Ht	=	Peak height found in sample
ARF	=	Average response factor [(RFCalib1 + ...+ RFCalib5)/5]
FV	=	Final volume of sample extract (mL)
DF	=	Dilution factor (where applicable)
IV	=	Initial volume of sample extracted (mL)
IW	=	Initial weight of the sample extracted (g)
AF	=	Additional factor

If a curve is used, then $\frac{\text{Pk Ht}}{\text{ARF}}$ is replaced by the following in the preceding equation:

$$\frac{Pk\ Ht - y\ intercept}{slope}$$

Results are reported as µg/L for water samples and µg/kg for solid samples. Soil samples are reported on dry-weight basis. Results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

TPH-GRO and TPH-DRO Calculations:

For TPH-GRO and TPH-DRO, an external calibration procedure of at least five levels of standards is used. The resulting point-to-point calibration curve is used by the data system to calculate analyte concentrations. The equations that the data system uses for calculating analyte concentrations are shown below:

$$Concentration = \left(\frac{Ax}{ARF}\right) \times (DF)$$

Where:

Ax = Total peak area in region defined as analyte
DF = Dilution factor
ARF = Average response factor from the calibration curve, calculated as shown below:

$$ARF = \frac{[(As1/Qs1) + (As2/Qs2) + (As3/Qs3) + (As4/Qs4) + (As5/Qs5) + \ldots (Asn/Qsn)]}{n}$$

Where:

As# = Analyte peak sum area for all components of calibration level #
Qs# = Analyte concentration sum for all components of calibration level #
n = Number of calibration levels

For DRO, the concentration determined is then multiplied by F/IV (or IW) to account for the sample preparation.

Where:

F = Final extract volume (mL)
IV = Initial sample volume (mL)
IW = Initial sample weight (g)

Results are reported in mg/L for water samples and in mg/kg for solid samples. Soil samples are reported on a dry-weight basis. Results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

Inorganic Calculations:

The results for inorganic analyses are calculated using the following equation:

$$Concentration = \frac{(A)\ (D)\ (E)}{IV\ (or\ IW)}$$

Where:

A = The concentration determined using calibration data programmed into the instrument (mg/L)
D = Dilution factor if needed
E = Final extract volume (mL)
IW = Initial sample weight (g)
IV = Initial sample volume (mL)

Results are usually reported in mg/L for water samples and in mg/kg for solid samples. Alternate units are available upon request. Soil samples are reported on a dry-weight basis. The results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

GROUP C

ASSESSMENT AND OVERSIGHT

C1. Assessments and Response Actions

Whenever any of the data generated falls outside of the established acceptance criteria outlined for instrument tune and calibration (Element B7) and internal QC (Element B5), the cause of this irregularity must be investigated, corrected, and documented. The documentation will be used to prevent a recurrence of the problem and to inform management of the situation.

If the results are not within acceptance criteria, the appropriate corrective action will be initiated. This may include, but is not limited to, checking calculations and instrument performance, reanalysis of the associated samples, examining other QC analyzed with the same batch of samples, and qualifying results with a comment stating the observed deviation.

A standard operating procedure is in place, which outlines the procedures to be followed when quality control data for an analysis falls outside of previously established acceptance limits. All batch QC data is entered into the computerized QC system promptly after its generation and evaluated for compliance. When the QC (blanks, check standards, continuing calibration verification, LCS/LCSD, etc) is noncompliant then corrective action is needed.

The Quality Assurance Department reviews monthly summaries of the quality control data entered onto the computerized sample management system by analysts. Control charts and statistics are reviewed for trends that may indicate problems with the analytical data. In this way, small problems are identified before they have any significant impact on laboratory results.

System audits are conducted on each department at Lancaster Laboratories by members of the Quality Assurance Department to ensure compliance with laboratory procedures and assist in identifying and correcting deficiencies. The audits include checks on methodology, reagent preparation, equipment calibration and maintenance, quality control results, and training of personnel. These audits may entail observation of procedures in process or a review of records to demonstrate traceability and compliance with all documented record keeping procedures. The QA Department will then issue a written report to management and the department that summarizes the audit. The department must respond in

writing to the audit report within 30 days of report receipt. The response must address the corrective action that needs to be taken along with an expected completion date and identify the employee responsible for completing the action. Audit results and the corresponding response are communicated to laboratory personnel and management. Follow-up audits verify that proper corrective action has been implemented.

Audits by outside organizations including clients, regulatory personnel, and the USEPA are permitted by arrangement with the Quality Assurance Department.

Performance audits consist of both intralaboratory and interlaboratory check samples. QC samples from commercial suppliers are analyzed quarterly to assess laboratory accuracy including a double blind program. The Laboratory also participates in a number of interlaboratory performance evaluation studies, which involve analysis of samples with concentrations of analytes that are known to the sponsoring organization, but unknown to the laboratory. Inorganics, pesticide/herbicides, trihalomethanes, volatile organic compounds, semivolatile organic compounds, and traditional wet chemistry analyses are analyzed by Lancaster Labs for studies conducted by various state agencies and private vendors (WS, WP, solid and hazardous waste). Representative results from some of these studies are in Figure C1-2.

When performance evaluation studies are identified as out of specification or when a nonconformance is due to a repetitive laboratory error, system failures, or observable trend, an Investigation and Corrective Action Report (ICAR) is issued. An example of an ICAR form is in Figure C1-1. The QA Department will circulate all completed Investigation and Corrective Action forms to the appropriate management.

Annually the QA Department itself is audited for compliance with corporate and departmental procedures, and meeting regulatory requirements. In a separate event, the laboratory Executive Group reviews the previous year's activities and documentation to evaluate the effectiveness of the quality system and its implementation/adequacy for the operation.

Figure C1-1

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

No. _____

Investigation and Corrective Action Report (ICAR)

Part I – Description of the Problem (Attach additional pages, if needed, in addition to supporting documentation.)

1. Date of issue:
2. LL sample number(s) involved:
3. Nature of the problem (describe in detail):

Initiated by: _____

Part II - The Investigation (Attach additional pages, if needed, in addition to supporting documentation.)

1. Steps taken to investigate the problem:
2. Explanation of probable cause(s):
3. Steps taken to prevent future occurrence (describe in detail and use corrective action check boxes below):

Corrective action(s): Check the appropriate box and attach supporting documentation

- ☐ Employee(s) retrained. (Attach proof of training)
- ☐ Employee(s) reread SOP, OMC, EQV, etc. (Attach copy of updated training record form)
- ☐ Other measures taken (Attach memo or equivalent proof)
- ☐ Further investigation needed from additional areas. (Include proof of the transfer of information)
- ☐ Additional information added to method reference – Pharm. option only (Attach proof)

4. Must investigation be complete before reporting further data to clients? Yes No
5. In addition to the samples listed above, would any additional data already reported to clients be affected by this problem? Yes No If yes, please explain:

Investigator(s): ..... Date: _____

Departmental Review*: ..... Date: _____
(*Group Leader or above, must be someone other than the investigator)

Quality Assurance: ..... Date: _____

Return to QA by: ..... Date: _____

2084.01 05/29/01

Performance Summary

VAP Periodic #: 12

APG Lab Code: 6056 VAP Lab Code: CL0070

Lancaster Laboratories Inc.
2425 New Holland Pike
Lancaster, PA 17601

APG Customer Code 6056
VAP Lab Code CL0070

Lancaster Laboratories Inc.
2425 New Holland Pike
Lancaster, PA 17601

VAP Periodic # 12

Study Closed on 09/18/2003

Product: Semi-Volatile Organic **Lot Number: 37286-37287** **Date Tested: 8/21/2003**

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
1,2,4-Trichlorobenzene	132.	164		ug/L	48.8-173	0.871	EPA8270C	Acceptable
1,2-Dichlorobenzene	76.7	96.1		ug/L	31-110	0.412	EPA8270C	Acceptable
1,3-Dichlorobenzene	44.4	55.7		ug/L	24.4-55.7	1.13	EPA8270C	Acceptable
1,4-Dichlorobenzene	48.3	61.2		ug/L	20-68.6	0.425	EPA8270C	Acceptable
2,4,6-Trichlorophenol	46.7	49.4		ug/L	21.9-57.8	0.993	EPA8270C	Acceptable
2,4-Dichlorophenol	89.0	100		ug/L	54.4-103	1.11	EPA8270C	Acceptable
2,4-Dimethylphenol	19.2	24.5		ug/L	4.94-26.1	0.902	EPA8270C	Acceptable
2,4-Dinitrophenol	106.	126		ug/L	5.91-153	0.92	EPA8270C	Acceptable
2,4-Dinitrotoluene (2,4-DNT)	186.	191		ug/L	69.5-243	0.893	EPA8270C	Acceptable
2,6-Dinitrotoluene (2,6-DNT)	99.6	113		ug/L	50.6-141	0.205	EPA8270C	Acceptable
2-Chloronaphthalene	94.8	110		ug/L	49.8-119	0.756	EPA8270C	Acceptable
2-Chlorophenol	122.	132		ug/L	46.7-157	0.939	EPA8270C	Acceptable
2-Methyl-4,6-Dinitrophenol	78.5	86.3		ug/L	38.3-98.5	0.863	EPA8270C	Acceptable
2-Nitrophenol	138.	149		ug/L	48.9-197	0.524	EPA8270C	Acceptable
3,3'-Dichlorobenzidine	<1.0			ug/L			EPA8270C	No Evaluation
4-Bromophenyl phenyl ether	<1.0			ug/L			EPA8270C	No Evaluation
4-Chloro-3-methylphenol	134.	150		ug/L	68.9-172	0.647	EPA8270C	Acceptable
4-Chlorophenyl phenyl ether	<1.0			ug/L			EPA8270C	No Evaluation
4-Nitrophenol	<10.0	12.5		ug/L	0-12.5		EPA8270C	Unacceptable
Acenaphthene	65.2	70.1		ug/L	31.1-85.1	0.676	EPA8270C	Acceptable
Acenaphthylene	69.3	71.3		ug/L	32.2-83.1	1.18	EPA8270C	Acceptable
Anthracene	68.7	79.3		ug/L	37.3-91.9	0.387	EPA8270C	Acceptable
Benzidine	<20.			ug/L			EPA8270C	No Evaluation

Figure C1-2 – Continued

APG Customer Code 6056
VAP Lab Code CL0070

Lancaster Laboratories Inc.
2425 New Holland Pike
Lancaster, PA 17601

VAP Periodic # 12

Study Closed on 09/18/2003

Product: Semi-Volatile Organic **Lot Number: 37286-37287** **Date Tested: 8/21/2003**

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
Benzo(a)anthracene	130.	137		ug/L	53.9-175	0.681	EPA8270C	Acceptable
Benzo(a)pyrene	8.98	10.9		ug/L	0-14.4	0.76	EPA8270C	Acceptable
Benzo(b)fluoranthene	<1.0			ug/L			EPA8270C	No Evaluation
Benzo(g,h,i)perylene	<1.0			ug/L			EPA8270C	No Evaluation
Benzo(k)fluoranthene	<1.0			ug/L			EPA8270C	No Evaluation
Bis(2-Chloroethoxy)methane	<1.0			ug/L			EPA8270C	No Evaluation
Bis(2-Chloroethyl)ether	<1.0			ug/L			EPA8270C	No Evaluation
Bis(2-Chloroisopropyl)ether	<1.0			ug/L			EPA8270C	No Evaluation
Bis(2-Ethylhexyl)phthalate	187.	172		ug/L	65.5-219	1.48	EPA8270C	Acceptable
Butyl benzyl phthalate	91.7	157		ug/L	11.6-219	0.58	EPA8270C	Acceptable
Chrysene	135.	145		ug/L	62.4-182	0.56	EPA8270C	Acceptable
Di-n-butyl phthalate	66.3	84.5		ug/L	29.4-116	0.387	EPA8270C	Acceptable
Di-n-octyl phthalate	62.7	67.7		ug/L	18.4-93.6	0.459	EPA8270C	Acceptable
Dibenzo(a,h)anthracene	<1.0			ug/L			EPA8270C	No Evaluation
Diethyl phthalate	117.	171		ug/L	22.2-233	0.27	EPA8270C	Acceptable
Dimethyl phthalate	46.1	134		ug/L	0-189	0.997	EPA8270C	Acceptable
Fluoranthene	56.2	62.4		ug/L	31.9-76.7	0.219	EPA8270C	Acceptable
Fluorene	132.	139		ug/L	66.5-169	0.704	EPA8270C	Acceptable
Hexachlorobenzene	49.2	55.8		ug/L	27.4-66.7	0.276	EPA8270C	Acceptable
Hexachlorobutadiene	40.3	60.9		ug/L	20.6-63.1	0.194	EPA8270C	Acceptable
Hexachlorocyclopentadiene	21.6	40.3		ug/L	0-50.3	0.214	EPA8270C	Acceptable
Hexachloroethane	85.9	124		ug/L	20.8-147	0.0776	EPA8270C	Acceptable
Indeno(1,2,3-cd)pyrene	<1.0			ug/L			EPA8270C	No Evaluation

Figure C1-2 – Continued

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VAP Periodic # 12

Study Closed on 09/18/2003

Product: Semi-Volatile Organic **Lot Number: 37286-37287** **Date Tested: 8/21/2003**

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
Isophorone	101.	107		ug/L	34-141	0.644	EPA8270C	Acceptable
N-nitrosodi-n-propylamine	<1.0			ug/L			EPA8270C	No Evaluation
N-nitrosodimethylamine	<2.0			ug/L			EPA8270C	No Evaluation
N-nitrosodiphenylamine	<2.0			ug/L			EPA8270C	No Evaluation
Naphthalene	70.3	80.5		ug/L	33.6-86.7	0.981	EPA8270C	Acceptable
Nitrobenzene (NB)	81.7	87.3		ug/L	34.8-108	0.725	EPA8270C	Acceptable
Pentachlorophenol	143.	176		ug/L	53.8-236	0.0568	EPA8270C	Acceptable
Phenanthrene	72.9	82		ug/L	37.9-101	0.279	EPA8270C	Acceptable
Phenol	71.5	186		ug/L	8.68-186	0.547	EPA8270C	Acceptable
Pyrene	168.	173		ug/L	75.2-220	0.712	EPA8270C	Acceptable

Figure C1-2 – Continued

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VAP Periodic # 12

Study Closed on 09/18/2003

Product: Total Cyanide **Lot Number: 37272** **Date Tested: 8/20/2003**

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
Total Cyanide	0.794	0.791		mg/L	0.582-0.984	0.141	335.2(CLP-M)	Acceptable

Figure C1-2 – Continued

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Study Closed on 09/18/2003

Product: Minerals (Na, Mg, K, Ca, CL, SO4) **Lot Number: 37276-37277** **Date Tested: 8/22/2003**

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
Calcium	42.3	42.8		mg/L	38.9-47.9	0.629	6010B	Acceptable
Chloride		191		mg/L	177-205			No Evaluation
Magnesium	30.3	30.3		mg/L	27-33.4	0.0806	6010B	Acceptable
Potassium	15.7	15.8		mg/L	13.8-17.8	0.128	6010B	Acceptable
Sodium	69.9	73.9		mg/L	67.7-80	1.68	6010B	Acceptable
Sulfate		123		mg/L	0-211			No Evaluation

Figure C1-2 – Continued

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VAP Periodic # 12

Study Closed on 09/18/2003

Product: Trace Metals **Lot Number: 37325-37326** **Date Tested: 8/22/2003**

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
Aluminum	3510.	3560		ug/L	3140-3950	0.19	6010B	Acceptable
Antimony	537.	524		ug/L	385-613	0.862	6010B	Acceptable
Arsenic	283.	299		ug/L	256-345	0.988	6010B	Acceptable
Barium	1410.	1430		ug/L	1250-1590	0.149	6010B	Acceptable
Beryllium	167.	171		ug/L	148-190	0.248	6010B	Acceptable
Boron	583.	574		ug/L	512-654	0	6010B	Acceptable
Cadmium	276.	285		ug/L	248-319	0.588	6010B	Acceptable
Chromium	460.	468		ug/L	416-521	0.39	6010B	Acceptable
Cobalt	945.	972		ug/L	890-1070	1.03	6010B	Acceptable
Copper	260.	260		ug/L	259-316	2.55	6010B	Acceptable
Iron	543.	600		ug/L	521-681	1.87	6010B	Acceptable
Lead	1220.	1250		ug/L	1120-1380	0.602	6010B	Acceptable
Manganese	1330.	1350		ug/L	1230-1480	0.628	6010B	Acceptable
Mercury	6.85	6.51		ug/L	5.04-7.96	0.619	7470a	Acceptable
Molybdenum	210.	196		ug/L	171-221	1.44	6010B	Acceptable
Nickel	1200.	1190		ug/L	1050-1280	0.883	6010B	Acceptable
Selenium	719.	742		ug/L	608-840	0.111	6010B	Acceptable
Silver	264.	268		ug/L	235-302	0.31	6010B	Acceptable
Strontium	133.	134		ug/L	111-153	0.123	6010B	Acceptable
Thallium	79.2	77		ug/L	61.8-90.2	0.582	6010B	Acceptable
Titanium	260.	256		ug/L	225-283	0.531	6010B	Acceptable
Vanadium	2360.	2400		ug/L	2130-2580	0	6010B	Acceptable
Zinc	820.	840		ug/L	758-930	0.719	6010B	Acceptable

Figure C1-2 – Continued

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VAP Periodic # 12

Study Closed on 09/18/2003

Product: Diesel Range Organics (8015A, 8015B) **Lot Number:** 37280 **Date Tested:** 8/20/2003

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
TPH Diesel (DRO)	1.67	1.85		mg/L	0-7.33	0.0138	8015B	Acceptable

Figure C1-2 – Continued

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VAP Periodic # 12

Study Closed on 09/18/2003

Product: Gasoline Range Organics (8015A, 8015B) **Lot Number:** 37281 **Date Tested:** 8/20/2003

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
TPH Gasoline (GRO)	2.5	3.04		mg/L	1.01-3.91	0.071	8015B	Acceptable

Figure C1-2 – Continued

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VAP Periodic # 12

Study Closed on 09/18/2003

Product: Chlorinated Pesticides **Lot Number: 37288-37289** **Date Tested: 8/24/2003**

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
4,4'-DDD	2.88	1.88		ug/L	1.04-2.51	3.88	8081A	Unacceptable
4,4'-DDE	0.423	0.33		ug/L	0.167-0.427	2.5	8081A	Acceptable
4,4'-DDT	0.974	0.721		ug/L	0.361-0.955	2.75	8081A	Unacceptable
Aldrin	1.73	1.68		ug/L	0.557-2.14	1.24	8081A	Acceptable
alpha-BHC	5.30	4.25		ug/L	1.97-5.53	2.24	8081A	Acceptable
beta-BHC	13.0	12.7		ug/L	5.73-17.3	0.67	8081A	Acceptable
delta-BHC	50.7	54.9		ug/L	16.3-76	0.397	8081A	Acceptable
Dieldrin	1.76	1.48		ug/L	0.852-1.96	1.68	8081A	Acceptable
Endosulfan I	22.0	22.4		ug/L	10.9-31.2	0.255	8081A	Acceptable
Endosulfan II	67.7	71.1		ug/L	19.1-109	0.207	8081A	Acceptable
Endosulfan sulfate	12.5	11.4		ug/L	3.53-17.3	0.789	8081A	Acceptable
Endrin	18.0	20.2		ug/L	8.68-28.8	0.205	8081A	Acceptable
Endrin aldehyde	12.9	12.7		ug/L	5.16-17.6	0.622	8081A	Acceptable
gamma-BHC	15.4	16.5		ug/L	6.53-22.6	0.256	8081A	Acceptable
Heptachlor	3.13	3.19		ug/L	1.09-4.19	0.815	8081A	Acceptable
Heptachlor epoxide (beta)	1.60	1.43		ug/L	0.804-1.76	1.72	8081A	Acceptable
Methoxychlor	24.2	16.5		ug/L	8.07-22.1	3.35	8081A	Unacceptable

Figure C1-2 – Continued

VAP Periodic # 12

Product: PAH (8100, 8310, 610) **Lot Number: 37290** **Date Tested: 8/26/2003**

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
Acenaphthene	19.2	21.9		ug/L	7.99-25.9	0.632	8310	Acceptable
Acenaphthylene	5.49	6.06		ug/L	1.19-7.85	0.752	8310	Acceptable
Anthracene	0.465	0.53		ug/L	0.00106-0.656	1.08	8310	Acceptable
Benzo(a)anthracene	1.16	1.38		ug/L	0.193-2.27	0.174	8310	Acceptable
Benzo(a)pyrene	0.964	1.18		ug/L	0-6.14	0.118	8310	Acceptable
Benzo(b)fluoranthene	<0.04			ug/L			8310	No Evaluation
Benzo(g,h,i)perylene	<0.10			ug/L			8310	No Evaluation
Benzo(k)fluoranthene	<0.02			ug/L			8310	No Evaluation
Chrysene	1.03	1.17		ug/L	0.397-1.54	0.281	8310	Acceptable
Dibenzo(a,h)anthracene	<0.04			ug/L			8310	No Evaluation
Fluoranthene	0.804	0.992		ug/L	0.456-1.08	0.317	8310	Acceptable
Fluorene	12.3	14.9		ug/L	6.39-16.8	0.347	8310	Acceptable
Indeno(1,2,3-cd)pyrene	<0.08			ug/L			8310	No Evaluation
Naphthalene	19.8	24.1		ug/L	7.72-27.3	0.607	8310	Acceptable
Phenanthrene	0.958	1.06		ug/L	0.544-1.51	0.385	8310	Acceptable
Pyrene	0.911	1.04		ug/L	0.19-1.59	0.0775	8310	Acceptable

Figure C1-2 – Continued

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VAP Periodic # 12

Study Closed on 09/18/2003

Product: PCB's **Lot Number: 37291** **Date Tested: 8/21/2003**

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
Aroclor 1232 Sample 1	<0.10			ug/L			8082	No Evaluation
Aroclor 1248 Sample 1	<0.10			ug/L			8082	No Evaluation
Aroclor 1254 Sample 1	<0.10			ug/L			8082	No Evaluation
Aroclor 1260 Sample 1	2.58	2.68		ug/L	0-34.5	0.495	8082	Acceptable

Figure C1-2 – Continued

APG Customer Code 6056
VAP Lab Code CL0070

Lancaster Laboratories Inc.
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Lancaster, PA 17601

VAP Periodic # 12

Study Closed on 09/18/2003

Product: Volatiles (8010B&8020A,8000/8200 Ser,601&602,624) **Lot Number:** 37218 **Date Tested:** 8/27/2003

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
1,1,1-Trichloroethane	160.	203		ug/L	140-259	1.69	8021B	Acceptable
1,1,2,2-Tetrachloroethane	95.9	112		ug/L	77.3-146	1.2	8021B	Acceptable
1,1,2-Trichloroethane	160.	173		ug/L	124-218	0.608	8021B	Acceptable
1,1-Dichloroethane	<0.2			ug/L			8021B	No Evaluation
1,1-Dichloroethene (Vinylidene chloride)	190.	223		ug/L	132-325	1.04	8021B	Acceptable
1,2-Dichlorobenzene	190.	207		ug/L	146-258	0.553	8021B	Acceptable
1,2-Dichloroethane	0.300			ug/L			8021B	No Evaluation
1,2-Dichloropropane	210.	244		ug/L	188-294	1.51	8021B	Acceptable
1,3-Dichlorobenzene	0.295			ug/L			8021B	No Evaluation
1,4-Dichlorobenzene	170.	201		ug/L	130-242	0.737	8021B	Acceptable
2-Chloroethyl vinyl ether	<1.0			ug/L			8021B	No Evaluation
Benzene	190.	215		ug/L	165-266	1.32	8021B	Acceptable
Bromodichloromethane	<0.2			ug/L			8021B	No Evaluation
Bromoform	240.	224		ug/L	152-310	0.296	8021B	Acceptable
Bromomethane	<0.5			ug/L			8021B	No Evaluation
Carbon tetrachloride	190.	244		ug/L	135-360	1.31	8021B	Acceptable
Chlorobenzene	210.	232		ug/L	170-287	0.841	8021B	Acceptable
Chloroethane	<0.2			ug/L			8021B	No Evaluation
Chloroform	170.	208		ug/L	135-278	1.34	8021B	Acceptable
Chloromethane	<0.5			ug/L			8021B	No Evaluation
cis-1,3-Dichloropropene	<0.2			ug/L			8021B	No Evaluation
Dibromochloromethane	140.	145		ug/L	100-191	0.341	8021B	Acceptable

Figure C1-2 – Continued

VAP Periodic # 12

Product: Volatiles (8010B&8020A,8000/8200 Ser,601&602,624) **Lot Number:** 37218 **Date Tested:** 8/27/2003

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
Dichlorodifluoromethane	<0.2			ug/L			8021B	No Evaluation
Ethylbenzene	61.3	61.5		ug/L	40.4-78.7	0.229	8021B	Acceptable
Methylene chloride (Dichloromethane)	57.6	65.9		ug/L	40.2-92	0.85	8021B	Acceptable
Tetrachloroethene	150.	194		ug/L	100-249	0.865	8021B	Acceptable
Toluene	210.	241		ug/L	172-301	1.04	8021B	Acceptable
Trans-1,2-Dichloroethene	85.3	103		ug/L	70.7-136	1.4	8021B	Acceptable
trans-1,3-Dichloropropene	<0.2			ug/L			8021B	No Evaluation
Trichloroethene	62.7	64		ug/L	44.1-80.9	0.028	8021B	Acceptable
Trichlorofluoromethane	<0.2			ug/L			8021B	No Evaluation
Vinyl chloride	<0.2			ug/L			8021B	No Evaluation

Product: Volatiles (8010B&8020A,8000/8200 Ser,601&602,624) **Lot Number:** 37219 **Date Tested:** 8/27/2003

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
1,1,1-Trichloroethane	270.	236		ug/L	162-301	1.46	8260B	Acceptable
1,1,2,2-Tetrachloroethane	145.	149		ug/L	101-196	0.163	8260B	Acceptable
1,1,2-Trichloroethane	54.0	53.2		ug/L	38.8-66.7	0.221	8260B	Acceptable
1,1-Dichloroethane	<1.0			ug/L			8260B	No Evaluation
1,1-Dichloroethene (Vinylidene chloride)	71.7	59.6		ug/L	36.5-87.8	0.966	8260B	Acceptable
1,2-Dichlorobenzene	182.	183		ug/L	130-228	0.157	8260B	Acceptable
1,2-Dichloroethane	<1.0			ug/L			8260B	No Evaluation
1,2-Dichloropropane	160.	145		ug/L	110-177	1.31	8260B	Acceptable

Figure C1-2 – Continued

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VAP Lab Code CL0070

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VAP Periodic # 12

Study Closed on 09/18/2003

Product: Volatiles (8010B&8020A,8000/8200 Ser,601&602,624) **Lot Number:** 37219 **Date Tested:** 8/27/2003

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
1,3-Dichlorobenzene	<1.0			ug/L			8260B	No Evaluation
1,4-Dichlorobenzene	88.6	90.8		ug/L	59.8-109	0.428	8260B	Acceptable
2-Chloroethyl vinyl ether	<2.0			ug/L			8260B	No Evaluation
Benzene	238.	214		ug/L	164-265	1.17	8260B	Acceptable
Bromodichloromethane	<2.0			ug/L			8260B	No Evaluation
Bromoform	156.	146		ug/L	98.8-201	0.302	8260B	Acceptable
Bromomethane	<1.0			ug/L			8260B	No Evaluation
Carbon tetrachloride	97.2	84.3		ug/L	47.3-122	0.882	8260B	Acceptable
Chlorobenzene	215.	209		ug/L	154-259	0.443	8260B	Acceptable
Chloroethane	<1.0			ug/L			8260B	No Evaluation
Chloroform	143.	130		ug/L	84.4-174	0.809	8260B	Acceptable
Chloromethane	<1.0			ug/L			8260B	No Evaluation
cis-1,3-Dichloropropene	<1.0			ug/L			8260B	No Evaluation
Dibromochloromethane	214.	207		ug/L	143-273	0.238	8260B	Acceptable
Dichlorodifluoromethane	<2.0			ug/L			8260B	No Evaluation
Ethylbenzene	134.	128		ug/L	78.3-167	0.643	8260B	Acceptable
Methylene chloride (Dichloromethane)	83.7	76.8		ug/L	47.6-106	0.602	8260B	Acceptable
Tetrachloroethene	177.	185		ug/L	95.5-238	0.364	8260B	Acceptable
Toluene	53.5	52.2		ug/L	34.1-66.7	0.491	8260B	Acceptable
Trans-1,2-Dichloroethene	109.	95.9		ug/L	65.7-126	1.1	8260B	Acceptable
trans-1,3-Dichloropropene	<1.0			ug/L			8260B	No Evaluation
Trichloroethene	135.	121		ug/L	80.1-154	1.27	8260B	Acceptable

Figure C1-2 – Continued

VAP Periodic # 12

Product: Volatiles (8010B&8020A,8000/8200 Scr,601&602,624) **Lot Number:** 37219 **Date Tested:** 8/27/2003

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
Trichlorofluoromethane	<2.0			ug/L			8260B	No Evaluation
Vinyl chloride	<1.0			ug/L			8260B	No Evaluation

Figure C1-2 – Continued

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VAP Lab Code CL0070

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VAP Periodic # 12

Study Closed on 09/18/2003

Product: TPH 418.1 for IR only **Lot Number: 37293** **Date Tested: 8/26/2003**

Analyte	Reported Value	Assigned Value	Mean	Units	Acceptance Range	Z-Score	Test Method	Evaluation
TPH by 418.1	119.	66.2		mg/L	41.5-118	2.65	418.1	Unacceptable

Figure C1-2 -- Continued

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C2. Reports To Management

Reports of quality status from the Quality Assurance Department to management are made frequently and in various forms. All results from internal or external performance evaluation samples are circulated to management along with corrective action responses. A report of each audit performed is prepared and copied to management. Monthly summaries of data obtained from analysis of quality control check samples are generated via the computerized sample management system. These summaries include mean and standard deviation to aid in assessment of data accuracy and precision. These are reviewed by QA personnel to evaluate trends. Any issues are communicated to the technical department management. Documentation summarizing problems that require investigation and corrective action are completed by group leaders and circulated to management. Through these channels, laboratory management is kept apprised of QA/QC activities.

Any problems or unusual observations that occur during the analysis of samples for a specific project will be listed on the laboratory report and/or in the case narrative delivered with the data package. The items often discussed in this manner include samples with surrogate recovery outside of the acceptance criteria and samples with matrix problems requiring dilution and causing increased detection limits. Where applicable, any corrective action attempted or performed to address the problem will also be presented.

Monthly and quarterly reports are sent to management, which provide them with the quality status on each technical department. The reports detail areas of improvement, observable trends, ICAR summaries, MDL/statistical window status, and a summary of client/agency issues. Reports are also generated for support groups closely tied to technical operations (i.e., Sample Administration, Bottles, and Sample Support).

The laboratory will contact the client for direction regarding major problems. Such as, but not limited to samples listed on the chain of custody but missing from the shipping container, samples which arrive broken or are accidentally broken in the laboratory, and samples with severe matrix problems. The client will be contacted if it is necessary to change any item in the original approved project plan.

GROUP D

DATA VALIDATION AND USABILITY

D1. Data Review, Verification, and Validation

As stated in Element B10, following review, interpretation, and data reduction by the analyst, the data is transferred into the Laboratory Information Management System (LIMS) by manual entry or direct upload from the analytical data system. This system stores the client information, sample results, and QC results. A security system is in place to control access of laboratory personnel and to provide an audit trail for information changes.

The data is again reviewed by the group leader or another analyst whose function is to provide an independent review before data is verified on the LIMS. The person performing the verification step reviews all data including quality control information before verifying the data. Any errors identified and corrected during the review process are documented and addressed with appropriate personnel to ensure generation of quality data.

If data package deliverables have been requested, the laboratory will complete the appropriate forms (see Appendix A) summarizing the quality control information, and transfer copies of all raw data (instrument printouts, spectra, chromatograms, laboratory notebooks, etc.) to the Data Deliverables Department. This group will combine the information from the various analytical groups and the analytical reports from the LIMS into one package in the client requested format. This package is reviewed for quality, compliance, and conformance to SOPs and QC requirements. Any analytical problems are discussed in the case narrative, which is also included with the data package deliverables.

The validation of the data for quality and compliance includes spot checking raw data versus the final report, checking that all pertinent raw data is included and does refer to the samples analyzed, review of all QC results for conformance with the method, and review of the case narrative for description of any unusual occurrences during analysis. This validation is performed using techniques similar to those used by the Sample Management Office for the USEPA's Contract Laboratory Program.

The validation performed by the laboratory does not address usability of the data, which usually requires some knowledge of the site. The laboratory will make every attempt to meet requirements of the project, thus reducing the need to assess usability of the data.

D2. Verification and Validation Methods

Lancaster Laboratories has procedures in place to verify that instrumental computers and the LIMS perform at the required accuracy, traceability, and security for reporting verified data. Element B10 describes this process in more detail.

Knowledge of the site and sampling methods are necessary to assess data usability. Therefore, overall data validation and assessment of data usability is the responsibility of the client. Lancaster Laboratories will evaluate the analytical data to verify that method and/or project requirements have been met.

D3. Reconciliation with User Requirements

Data quality requirements are based on the measurement process and the intended use of the data. Lancaster Laboratories evaluates the QC data generated by the following data quality objectives.

Precision – Precision refers to the reproducibility of a method when it is repeated on a second aliquot of the same sample. The degree of agreement is expressed as the relative percent difference (RPD). The RPD will be calculated according to the following equation:

$$RPD = \frac{|D_2 - D_1|}{\frac{(D_1 D_2)}{2}} \times 100$$

Where:

D_1 = First sample value
D_2 = Second sample value (Duplicate)

Duplicates will be run on at least 5% of the samples for inorganics analyses and matrix spike duplicates are used for organics analyses. Acceptance criteria are detailed in Element B5. All quality control sample results are entered into the LIMS and compared with acceptance limits. In addition, there is a monthly review of values on the computer QC system. Data obtained from quality control samples is entered onto our LIMS that charts the data and calculates a mean and standard deviation on a monthly basis. The Quality Assurance Department then reviews this data for trends, which may indicate analytical problems. The control charts are graphical methods for monitoring precision and bias over time.

Accuracy – Accuracy refers to the agreement between the amount of a compound measured by the test method and the amount present. Accuracy is usually expressed as a percent recovery (R). Recoveries will be calculated according to the following equations:

$$Surrogate\ \%\ Recovery = \frac{Qd}{Qa} \times 100$$

Where:

Qd = Quantity determined by analysis
Qa = Quantity added to sample

$$Matrix\ Spike\ \%\ Recovery = \frac{(SSR - SR)}{SA} \times 100$$

Where:

SSR = Spiked sample results
SR = Sample results
SA = Spike added

$$Laboratory\ Control\ Sample\ \%\ Recovery = \frac{LCS\ found}{LCS\ true} \times 100$$

As directed by the methods, surrogate standards are added to each sample analyzed for organics. Spikes and laboratory control samples will be run on at least 5% of the samples (each batch or Sample Delivery Group [SDG], ≤20 samples). Refer to Element B5 for acceptance criteria for accuracy. The LIMS is programmed to compare the individual values with the acceptance limits and inform the analyst if the results meet specifications. If the results are not within the acceptance criteria, corrective action suitable to the situation will be taken. This may include, but is not limited to, checking calculations and instrument performance, reanalysis of the associated samples, examining other QC analyzed with the same batch of samples, and qualifying results with documentation of any QC problems in the case narrative.

Commercial quality control materials are run at least quarterly to ensure accuracy of the analytical procedure. Repetitive analysis of a reference material will also yield precision data. Accuracy information determined from reference materials is valuable because variables specific to sample matrix are eliminated.
The QC program is capable of charting data for surrogates, spikes, control materials, and reference materials. The Quality Assurance Department reviews these charts in association with the monthly trend report for any indication of possible problems (i.e., shift in the mean and standard deviation).

Completeness – Completeness is the percentage of valid data acquired from a measurement system compared to the amount of valid measurements that were planned to be collected. The objective is analysis of all samples submitted intact, and to ensure that sufficient sample weight/volume is available should the initial analysis not meet acceptance criteria. The laboratory's LIMS will assign a unique identification number to the sample which tracks and controls movement of samples from the time of receipt until disposal. All data generated will be recorded referencing the corresponding sample identification number. The completeness of an analysis can be documented by including in the data deliverables sufficient information to allow the data user to assess the quality of the results. This information will include, but is not limited to, summaries of QC data and sample results, chromatograms, spectra, and instrument tune and calibration data. Additional information will be stored in the laboratory's archives, both hard copy and electronic.

$$Completeness = \frac{Number\ of\ valid\ measurements}{Total\ measurements\ needed} \times 100$$

Method Detection Limit – It is important to ascertain the limit of quantitation that can be achieved by a given method, particularly when the method is commonly used to determine trace levels of analyte. The Environmental Protection Agency has set forth one method for determining method detection limits (MDLs) from which limits of quantitation (LOQs) can be extrapolated. MDLs are evaluated on an annual basis. MDL is defined as follows for all measurements:

$$MDL = t_{(n-1,1-a=0.99)} \times S$$

Where:

MDL	=	Method detection limit
s	=	Standard deviation of the replicate analyses
$t_{(n-1,1-a=0.99)}$	=	Students' t-value for a one-sided 99% confidence level and a standard deviation estimate with n-1 degrees of freedom

Definitions:

Calculated Method Detection Limit – The calculated method detection limit is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. It is determined from analysis, on a given instrument, of a sample in a given matrix containing the analyte.

Reported Method Detection Limit (MDL) – The reported MDL is defined as the highest of all calculated MDLs obtained from all instruments used for a particular method/matrix. This can be the actual value or a default value set above the calculated values.

Limit of Quantitation (LOQ) – The limit of quantitation is defined as the level above which quantitative results may be obtained with a specified degree of confidence. The Lancaster Laboratories' policy is to set quantitation limits at a value at least 3× the MDL. Regulatory limits may require setting a lower LOQ. The judgement of the technical department management may be used to assess the feasibility of a lower LOQ.

APPENDIX A

EXAMPLE REPORTING FORMS

Lancaster Laboratories

ANALYTICAL RESULTS

Prepared for:

Example Client
2425 New Holland Pike
Lancaster, PA 17601

717-656-2300

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 884400. Samples arrived at the laboratory on Wednesday, February 11, 2004. The PO# for this group is 2110918.010102.

Client Description	Lancaster Labs Number
MW-6 Grab Water Sample	4214395
MW-7 Grab Water Sample	4214396
MW-22 Grab Water Sample	4214397
TB-021104 Trip Blank Water Sample	4214398
GW-77-12-18 Grab Water Sample	4214399
GW-772-12-18 Grab Water Sample	4214400
GP-773-06-08 Grab Soil Sample	4214401
GP-772-00-02 Grab Soil Sample	4214402
GP-772-10-12 Grab Soil Sample	4214403
GP-772-10-12-DUP Grab Soil Sample	4214404
GP-771-00-02 Grab Soil Sample	4214405
TB-021104 Trip Blank Water Sample	4214406

METHODOLOGY

The specific methodologies used in obtaining the enclosed analytical results are indicated on the laboratory chronicles.

1 COPY TO Example Client Attn: Ms. Joanne Smith
1 COPY TO Data Package Group

Lancaster Laboratories

Questions? Contact your Client Services Representative
Jeffrey S Moyer at (717) 656-2300.

Respectfully Submitted,

Melissa A McDermott
Senior Chemist

8889

MEMBER ACIL
Lancaster Laboratories, Inc.
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
717-656-2300 Fax: 717-656-2681

Analysis Report

Lancaster Laboratories

Lancaster Laboratories Sample No. WW 4214395

MW-6 Grab Water Sample

Collected:02/11/2004 10:00 by SB

Account Number: 10000

Example Client
2425 New Holland Pike
Lancaster, PA 17601

Submitted: 02/11/2004 18:35
Reported: 02/18/2004 at 09:11
Discard: 03/04/2004

EAMW6 SDG#: EWA79-01

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
00259	Mercury	7439-97-6	N.D.	0.00016	mg/l	1
01743	Aluminum	7429-90-5	0.430	0.0413	mg/l	1
01750	Calcium	7440-70-2	14.5	0.0494	mg/l	1
01754	Iron	7439-89-6	0.662	0.0453	mg/l	1
01757	Magnesium	7439-95-4	8.38	0.0183	mg/l	1
01762	Potassium	7440-09-7	1.48	0.0429	mg/l	1
01767	Sodium	7440-23-5	9.46	0.463	mg/l	1
07022	Thallium	7440-28-0	N.D.	0.0089	mg/l	1
07035	Arsenic	7440-38-2	N.D.	0.0049	mg/l	1
07036	Selenium	7782-49-2	N.D.	0.0047	mg/l	1
07044	Antimony	7440-36-0	N.D.	0.0085	mg/l	1
07046	Barium	7440-39-3	0.0432	0.00048	mg/l	1
07047	Beryllium	7440-41-7	N.D.	0.00034	mg/l	1
07049	Cadmium	7440-43-9	N.D.	0.00087	mg/l	1
07051	Chromium	7440-47-3	N.D.	0.0022	mg/l	1
07052	Cobalt	7440-48-4	N.D.	0.0016	mg/l	1
07053	Copper	7440-50-8	0.0044 J	0.0021	mg/l	1
07055	Lead	7439-92-1	N.D.	0.0093	mg/l	1
07058	Manganese	7439-96-5	0.192	0.00051	mg/l	1
07061	Nickel	7440-02-0	0.0080 J	0.0038	mg/l	1
07066	Silver	7440-22-4	N.D.	0.0018	mg/l	1
07071	Vanadium	7440-62-2	N.D.	0.0017	mg/l	1
07072	Zinc	7440-66-6	0.0313	0.0041	mg/l	1
00937	TCL Pesticides in Waters					
00938	Endrin Ketone	53494-70-5	N.D.	0.0040	ug/l	1
01361	Alpha Chlordane	5103-71-9	N.D.	0.0020	ug/l	1
01362	Gamma Chlordane	5103-74-2	N.D.	0.0020	ug/l	1
01600	Alpha BHC	319-84-6	N.D.	0.0020	ug/l	1
01601	Beta BHC	319-85-7	N.D.	0.012	ug/l	1
01602	Gamma BHC - Lindane	58-89-9	N.D.	0.0020	ug/l	1
01603	Delta BHC	319-86-8	N.D.	0.0030	ug/l	1
01604	Heptachlor	76-44-8	N.D.	0.0020	ug/l	1
01605	Aldrin	309-00-2	N.D.	0.0020	ug/l	1
01606	Heptachlor Epoxide	1024-57-3	0.0025 J	0.0020	ug/l	1
01607	p,p-DDE	72-55-9	N.D.	0.0040	ug/l	1
01608	p,p-DDD	72-54-8	N.D.	0.0040	ug/l	1
01609	p,p-DDT	50-29-3	N.D.	0.0040	ug/l	1
01610	Dieldrin	60-57-1	N.D.	0.0050	ug/l	1

Lancaster Laboratories

Lancaster Laboratories Sample No. WW 4214395

MW-6 Grab Water Sample

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Lancaster, PA 17601

Submitted: 02/11/2004 18:35
Reported: 02/18/2004 at 09:11
Discard: 03/04/2004

EAMW6 SDG#: EWA79-01

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
01611	Endrin	72-20-8	N.D.	0.0040	ug/l	1
01613	Toxaphene	8001-35-2	N.D.	0.30	ug/l	1
01615	Endosulfan II	33213-65-9	N.D.	0.0050	ug/l	1
01616	Endosulfan I	959-98-8	N.D.	0.0040	ug/l	1
01617	Endosulfan Sulfate	1031-07-8	N.D.	0.0090	ug/l	1
01618	Endrin Aldehyde	7421-93-4	N.D.	0.020	ug/l	1
01619	PCB-1016	12674-11-2	N.D.	0.20	ug/l	1
01620	PCB-1221	11104-28-2	N.D.	0.40	ug/l	1
01621	PCB-1232	11141-16-5	N.D.	0.10	ug/l	1
01622	PCB-1242	53469-21-9	N.D.	0.20	ug/l	1
01623	PCB-1248	12672-29-6	N.D.	0.30	ug/l	1
01624	PCB-1254	11097-69-1	N.D.	0.20	ug/l	1
01625	PCB-1260	11096-82-5	N.D.	0.30	ug/l	1
01860	Methoxychlor	72-43-5	N.D.	0.060	ug/l	1

Sufficient sample volume was not available to perform a MS/MSD for this analysis. Therefore, a LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.

04678 TCL SW846 Semivolatiles/Waters

03871	4-Chloroaniline	106-47-8	N.D.	1.	ug/l	1
03905	2-Methylnaphthalene	91-57-6	N.D.	1.	ug/l	1
03907	2-Nitroaniline	88-74-4	N.D.	1.	ug/l	1
03922	2,4,5-Trichlorophenol	95-95-4	N.D.	1.	ug/l	1
03924	2-Chlorophenol	95-57-8	N.D.	1.	ug/l	1
03925	Phenol	108-95-2	N.D.	1.	ug/l	1
03926	2-Nitrophenol	88-75-5	N.D.	1.	ug/l	1
03927	2,4-Dimethylphenol	105-67-9	N.D.	1.	ug/l	1
03928	2,4-Dichlorophenol	120-83-2	N.D.	1.	ug/l	1
03929	4-Chloro-3-methylphenol	59-50-7	N.D.	1.	ug/l	1
03930	2,4,6-Trichlorophenol	88-06-2	N.D.	1.	ug/l	1
03936	bis(2-Chloroethyl)ether	111-44-4	N.D.	1.	ug/l	1
03937	1,3-Dichlorobenzene	541-73-1	N.D.	1.	ug/l	1
03938	1,4-Dichlorobenzene	106-46-7	N.D.	1.	ug/l	1
03939	1,2-Dichlorobenzene	95-50-1	N.D.	1.	ug/l	1
03941	Hexachloroethane	67-72-1	N.D.	1.	ug/l	1
03942	N-Nitroso-di-n-propylamine	621-64-7	N.D.	1.	ug/l	1
03943	Nitrobenzene	98-95-3	N.D.	1.	ug/l	1
03944	Isophorone	78-59-1	N.D.	1.	ug/l	1
03945	bis(2-Chloroethoxy)methane	111-91-1	N.D.	1.	ug/l	1
03946	1,2,4-Trichlorobenzene	120-82-1	N.D.	1.	ug/l	1

Lancaster Laboratories

Lancaster Laboratories Sample No. WW 4214395

MW-6 Grab Water Sample

Collected:02/11/2004 10:00 by SB

Account Number: 10000

Example Client
2425 New Holland Pike
Lancaster, PA 17601

Submitted: 02/11/2004 18:35
Reported: 02/18/2004 at 09:11
Discard: 03/04/2004

EAMW6 SDG#: EWA79-01

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
03947	Naphthalene	91-20-3	N.D.	1.	ug/l	1
03948	Hexachlorobutadiene	87-68-3	N.D.	1.	ug/l	1
03949	Hexachlorocyclopentadiene	77-47-4	N.D.	5.	ug/l	1
03950	2-Chloronaphthalene	91-58-7	N.D.	1.	ug/l	1
03951	Acenaphthylene	208-96-8	N.D.	1.	ug/l	1
03952	Dimethylphthalate	131-11-3	N.D.	2.	ug/l	1
04680	2-Methylphenol	95-48-7	N.D.	1.	ug/l	1
04681	2,2'-oxybis(1-Chloropropane)	108-60-1	N.D.	1.	ug/l	1
04682	4-Methylphenol	106-44-5	N.D.	2.	ug/l	1
	3-Methylphenol and 4-methylphenol cannot be resolved under the chromatographic conditions used for sample analysis. The result reported for 4-methylphenol represents the combined total of both compounds.					
04679	TCL SW846 Semivolatiles/Waters					
03879	Dibenzofuran	132-64-9	N.D.	1.	ug/l	1
03908	3-Nitroaniline	99-09-2	N.D.	1.	ug/l	1
03909	4-Nitroaniline	100-01-6	N.D.	1.	ug/l	1
03931	2,4-Dinitrophenol	51-28-5	N.D.	20.	ug/l	1
03932	4-Nitrophenol	100-02-7	N.D.	10.	ug/l	1
03933	4,6-Dinitro-2-methylphenol	534-52-1	N.D.	5.	ug/l	1
03934	Pentachlorophenol	87-86-5	N.D.	3.	ug/l	1
03953	2,6-Dinitrotoluene	606-20-2	N.D.	1.	ug/l	1
03954	Acenaphthene	83-32-9	N.D.	1.	ug/l	1
03955	2,4-Dinitrotoluene	121-14-2	N.D.	1.	ug/l	1
03956	Fluorene	86-73-7	N.D.	1.	ug/l	1
03957	4-Chlorophenyl-phenylether	7005-72-3	N.D.	1.	ug/l	1
03958	Diethylphthalate	84-66-2	N.D.	2.	ug/l	1
03960	N-Nitrosodiphenylamine	86-30-6	N.D.	2.	ug/l	1
	N-nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for N-nitrosodiphenylamine represents the combined total of both compounds.					
03961	4-Bromophenyl-phenylether	101-55-3	N.D.	1.	ug/l	1
03962	Hexachlorobenzene	118-74-1	N.D.	1.	ug/l	1
03963	Phenanthrene	85-01-8	N.D.	1.	ug/l	1
03964	Anthracene	120-12-7	N.D.	1.	ug/l	1
03965	Di-n-butylphthalate	84-74-2	N.D.	2.	ug/l	1
03966	Fluoranthene	206-44-0	N.D.	1.	ug/l	1
03967	Pyrene	129-00-0	N.D.	1.	ug/l	1
03969	Butylbenzylphthalate	85-68-7	N.D.	2.	ug/l	1
03970	Benzo(a)anthracene	56-55-3	N.D.	1.	ug/l	1
03971	Chrysene	218-01-9	N.D.	1.	ug/l	1

Lancaster Laboratories

Lancaster Laboratories Sample No. WW 4214395

MW-6 Grab Water Sample

Collected:02/11/2004 10:00 by SB

Account Number: 10000

Example Client
2425 New Holland Pike
Lancaster, PA 17601

Submitted: 02/11/2004 18:35
Reported: 02/18/2004 at 09:11
Discard: 03/04/2004

EAMW6 SDG#: EWA79-01

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Units	Dilution Factor
03972	3,3'-Dichlorobenzidine	91-94-1	N.D.		1.	ug/l	1
03973	bis(2-Ethylhexyl)phthalate	117-81-7	N.D.		2.	ug/l	1
03974	Di-n-octylphthalate	117-84-0	N.D.		2.	ug/l	1
03975	Benzo(b)fluoranthene	205-99-2	N.D.		1.	ug/l	1
03976	Benzo(k)fluoranthene	207-08-9	N.D.		1.	ug/l	1
03977	Benzo(a)pyrene	50-32-8	N.D.		1.	ug/l	1
03978	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.		1.	ug/l	1
03979	Dibenz(a,h)anthracene	53-70-3	N.D.		1.	ug/l	1
03980	Benzo(g,h,i)perylene	191-24-2	N.D.		1.	ug/l	1
04684	Carbazole	86-74-8	N.D.		1.	ug/l	1

Sufficient sample volume was not available to perform a MS/MSD for this analysis. Therefore, a LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.

06291	TCL by 8260 (water)						
05385	Chloromethane	74-87-3	N.D.		1.	ug/l	1
05386	Vinyl Chloride	75-01-4	N.D.		1.	ug/l	1
05387	Bromomethane	74-83-9	N.D.		1.	ug/l	1
05388	Chloroethane	75-00-3	N.D.		1.	ug/l	1
05390	1,1-Dichloroethene	75-35-4	N.D.		0.8	ug/l	1
05391	Methylene Chloride	75-09-2	N.D.		2.	ug/l	1
05392	trans-1,2-Dichloroethene	156-60-5	N.D.		0.8	ug/l	1
05393	1,1-Dichloroethane	75-34-3	N.D.		1.	ug/l	1
05395	cis-1,2-Dichloroethene	156-59-2	N.D.		0.8	ug/l	1
05396	Chloroform	67-66-3	N.D.		0.8	ug/l	1
05398	1,1,1-Trichloroethane	71-55-6	N.D.		0.8	ug/l	1
05399	Carbon Tetrachloride	56-23-5	N.D.		1.	ug/l	1
05401	Benzene	71-43-2	N.D.		0.5	ug/l	1
05402	1,2-Dichloroethane	107-06-2	N.D.		1.	ug/l	1
05403	Trichloroethene	79-01-6	1.	J	1.	ug/l	1
05404	1,2-Dichloropropane	78-87-5	N.D.		1.	ug/l	1
05406	Bromodichloromethane	75-27-4	N.D.		1.	ug/l	1
05407	Toluene	108-88-3	N.D.		0.7	ug/l	1
05408	1,1,2-Trichloroethane	79-00-5	N.D.		0.8	ug/l	1
05409	Tetrachloroethene	127-18-4	1.	J	0.8	ug/l	1
05411	Dibromochloromethane	124-48-1	N.D.		1.	ug/l	1
05413	Chlorobenzene	108-90-7	N.D.		0.8	ug/l	1
05415	Ethylbenzene	100-41-4	N.D.		0.8	ug/l	1
05418	Styrene	100-42-5	N.D.		1.	ug/l	1
05419	Bromoform	75-25-2	N.D.		1.	ug/l	1

MEMBER ACIL
Lancaster Laboratories, Inc.
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
717-656-2300 Fax: 717-656-2681

Analysis Report

Lancaster Laboratories

Lancaster Laboratories Sample No. WW 4214395

MW-6 Grab Water Sample

Collected:02/11/2004 10:00 by SB

Account Number: 10000

Example Client
2425 New Holland Pike
Lancaster, PA 17601

Submitted: 02/11/2004 18:35
Reported: 02/18/2004 at 09:11
Discard: 03/04/2004

EAMW6 SDG#: EWA79-01

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
05421	1,1,2,2-Tetrachloroethane	79-34-5	N.D.	1.	ug/l	1
06302	Acetone	67-64-1	N.D.	6.	ug/l	1
06303	Carbon Disulfide	75-15-0	N.D.	1.	ug/l	1
06305	2-Butanone	78-93-3	N.D.	3.	ug/l	1
06306	trans-1,3-Dichloropropene	10061-02-6	N.D.	1.	ug/l	1
06307	cis-1,3-Dichloropropene	10061-01-5	N.D.	1.	ug/l	1
06308	4-Methyl-2-pentanone	108-10-1	N.D.	3.	ug/l	1
06309	2-Hexanone	591-78-6	N.D.	3.	ug/l	1
06310	Xylene (Total)	1330-20-7	N.D.	0.8	ug/l	1

A site-specific MSD sample was not submitted for the project. A LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
00259	Mercury	SW-846 7470A	1	02/13/2004 08:48	Damary Valentin	1
01743	Aluminum	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
01750	Calcium	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
01754	Iron	SW-846 6010B	1	02/16/2004 16:40	John P Hook	1
01757	Magnesium	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
01762	Potassium	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
01767	Sodium	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07022	Thallium	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07035	Arsenic	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07036	Selenium	SW-846 6010B	1	02/17/2004 00:15	Donna R Sackett	1
07044	Antimony	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07046	Barium	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07047	Beryllium	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07049	Cadmium	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07051	Chromium	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07052	Cobalt	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07053	Copper	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07055	Lead	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07058	Manganese	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07061	Nickel	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07066	Silver	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07071	Vanadium	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
07072	Zinc	SW-846 6010B	1	02/16/2004 00:35	Donna R Sackett	1
00937	TCL Pesticides in Waters	SW-846 8081A/8082	1	02/13/2004 11:14	Andrea J Covey	1

MEMBER ACIL
Lancaster Laboratories, Inc.
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
717-656-2300 Fax: 717-656-2681

Lancaster Laboratories

Lancaster Laboratories Sample No. WW 4214395

MW-6 Grab Water Sample

Collected:02/11/2004 10:00 by SB

Account Number: 10000

Example Client
2425 New Holland Pike
Lancaster, PA 17601

Submitted: 02/11/2004 18:35
Reported: 02/18/2004 at 09:11
Discard: 03/04/2004

EAMW6	SDG#: EWA79-01					
04678	TCL SW846 Semivolatiles/Waters	SW-846 8270C	1	02/14/2004 10:43	Susan L Scheuering	1
04679	TCL SW846 Semivolatiles/Waters	SW-846 8270C	1	02/14/2004 10:43	Susan L Scheuering	1
06291	TCL by 8260 (water)	SW-846 8260B	1	02/12/2004 21:44	Scott M Evans	1
00813	BNA Water Extraction	SW-846 3510C	1	02/12/2004 08:20	Denise L Trimby	1
00817	Water Sample Pest. Extraction	SW-846 3510C	1	02/13/2004 00:30	Karen L Beyer	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	02/12/2004 21:44	Scott M Evans	n.a.
01848	WW SW846 ICP Digest (tot rec)	SW-846 3005A	1	02/12/2004 20:00	James L Hertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	02/12/2004 17:00	Nelli S Markaryan	1

9915.

APPENDIX A

GC/MS VOLATILES
DATA DELIVERABLES FORMS

5A

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID: nm18t01.d BFB Injection Date: 03/18/04

Instrument ID: HP07159 BFB Injection Time: 12:44

Matrix: (soil/water) WATER Level: (low/med) LOW Column: (pack/cap) CAP

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	20.7
75	30.0 - 60.0% of mass 95	54.3
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	6.8
173	Less than 2.0% of mass 174	0.4 (0.5)1
174	Greater than 50.0% of mass 95	93.5
175	5.0 - 9.0% of mass 174	7.4 (7.9)1
176	Greater than 95.0%, but less than 101.0% of mass 174	91.4 (97.8)1
177	5.0 - 9.0% of mass 176	6.3 (6.9)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD100	VSTD100	nm18c01.d	03/18/04	13:08
02	VBLKN64	VBLKN64	nm18b01.d	03/18/04	13:58
03	LCSN64	LCSN64	nm18s01.d	03/18/04	14:23
04	EXBLKB	4235599	nm18s02.d	03/18/04	14:48
05	TSTPZ	4234111	nm18s03.d	03/18/04	15:13
06	TSTPZMS	4234111	nm18s04.d	03/18/04	15:38
07	TSTPZMSD	4234111	nm18s05.d	03/18/04	16:03
08	ZH315	4235000	nm18s06.d	03/18/04	16:28
09	EXBLKC	4232992	nm18s07.d	03/18/04	16:53
10	ZSOIL	4231735	nm18s08.d	03/18/04	17:19
11	ZHCAR	4231738	nm18s09.d	03/18/04	17:44
12	ZHCARMS	4231738	nm18s10.d	03/18/04	18:09
13	ZH597	4231979	nm18s11.d	03/18/04	18:34
14	ZH598	4231983	nm18s12.d	03/18/04	18:59
15	EXBLKD	4231344	nm18s14.d	03/18/04	19:50
16	WCCRZ	4230646	nm18s15.d	03/18/04	20:15
17	WCCRZMS	4230646	nm18s16.d	03/18/04	20:40
18	EXBLKE	4234768	nm18s17.d	03/18/04	21:06
19	ZH458	4232621	nm18s18.d	03/18/04	21:30
20	Z6464	4234382	nm18s19.d	03/18/04	21:55
21	Z6466	4234389	nm18s20.d	03/18/04	22:20
22	Z6465	4234393	nm18s21.d	03/18/04	22:45

2A

WATER VOLATILE SURROGATE RECOVERY

Lab Name: Lancaster Laboratories Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

	LL #'s	EPA SAMPLE NO.	S1 (DBF)#	S2 (DCA)#	S3 (TOL)#	S4 (BFB)#	TOT OUT
01	4232992	EXBLKC	95	90	96	95	0
02	VBLKN64	VBLKN64	95	94	95	97	0
03	4235599	EXBLKB	95	92	96	95	0
04	4234111	TSTPZ	95	94	95	96	0
05	4234111	TSTPZMS	96	94	95	97	0
06	4234111	TSTPZMSD	97	97	96	98	0
07	LCSN64	LCSN64	96	94	95	97	0

	QC LIMITS
S1 (DBF) = Dibromofluoromethane	(81-120)
S2 (DCA) = 1,2-Dichloroethane-d4	(82-112)
S3 (TOL) = Toluene-d8	(85-112)
S4 (BFB) = 4-Bromofluorobenzene	(83-113)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogate diluted out

1A

EPA SAMPLE NO.

VOLATILE ORGANICS ANALYSIS DATA SHEET

VBLKN64

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Matrix: (soil/water) WATER Lab Sample ID: VBLKN64

Sample wt/vol: 5.00 (g/mL) mL Lab File ID: HP07159.i/04mar18a.b/nm18b01.d

Level: (low/med) LOW Date Received:

Moisture: not dec. _____ Date Analyzed: 03/18/04

Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)	MDL ug/L	Q
75-71-8	Dichlorodifluoromethane		2	U
74-87-3	Chloromethane		1	U
75-01-4	Vinyl Chloride		1	U
74-83-9	Bromomethane		1	U
75-00-3	Chloroethane		2	U
75-69-4	Trichlorofluoromethane		50	U
64-17-5	Ethanol		40	U
107-02-8	Acrolein		0.8	U
75-35-4	1,1-Dichloroethene		2	U
76-13-1	Freon 113		6	U
67-64-1	Acetone		1	U
74-88-4	Methyl Iodide		50	U
67-63-0	2-Propanol		1	U
75-15-0	Carbon Disulfide		1	U
107-05-1	Allyl Chloride		2	U
75-09-2	Methylene Chloride		10	U
75-65-0	t-Butyl Alcohol		4	U
107-13-1	Acrylonitrile		0.8	U
156-60-5	trans-1,2-Dichloroethene		0.5	U
1634-04-4	Methyl Tertiary Butyl Ether		2	U
110-54-3	n-Hexane		0.8	U
540-59-0	1,2-Dichloroethene (total)		1	U
75-34-3	1,1-Dichloroethane		0.8	U
108-20-3	di-Isopropyl Ether		1	U
126-99-8	2-Chloro-1,3-Butadiene		0.8	U
637-92-3	Ethyl t-Butyl Ether		0.8	U
156-59-2	cis-1,2-Dichloroethene		3	U
78-93-3	2-Butanone		1	U
594-20-7	2,2-Dichloropropane		30	U
107-12-0	Propionitrile			

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKN64

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Matrix: (soil/water) WATER Lab Sample ID: VBLKN64

Sample wt/vol: 5.00 (g/mL) mL Lab File ID: HP07159.i/04mar18a.b/nm18b01.d

Level: (low/med) LOW Date Received:

Moisture: not dec. _____ Date Analyzed: 03/18/04

Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)	MDL ug/L	Q
126-98-7	Methacrylonitrile		10	U
74-97-5	Bromochloromethane		1	U
109-99-9	Tetrahydrofuran		4	U
67-66-3	Chloroform		0.8	U
71-55-6	1,1,1-Trichloroethane		0.8	U
110-82-7	Cyclohexane		2	U
563-58-6	1,1-Dichloropropene		1	U
56-23-5	Carbon Tetrachloride		1	U
78-83-1	Isobutyl Alcohol		100	U
71-43-2	Benzene		0.5	U
107-06-2	1,2-Dichloroethane		1	U
994-05-8	t-Amyl Methyl Ether		0.8	U
142-82-5	n-Heptane		2	U
71-36-3	n-Butanol		100	U
79-01-6	Trichloroethene		1	U
78-87-5	1,2-Dichloropropane		1	U
80-62-6	Methyl Methacrylate		1	U
74-95-3	Dibromomethane		1	U
123-91-1	1,4-Dioxane		70	U
75-27-4	Bromodichloromethane		1	U
79-46-9	2-Nitropropane		2	U
110-75-8	2-Chloroethyl Vinyl Ether		2	U
10061-01-5	cis-1,3-Dichloropropene		1	U
108-10-1	4-Methyl-2-Pentanone		3	U
108-88-3	Toluene		0.7	U
10061-02-6	trans-1,3-Dichloropropene		1	U
97-63-2	Ethyl Methacrylate		1	U
79-00-5	1,1,2-Trichloroethane		0.8	U
127-18-4	Tetrachloroethene		0.8	U
142-28-9	1,3-Dichloropropane		1	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKN64

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Matrix: (soil/water) WATER Lab Sample ID: VBLKN64

Sample wt/vol: 5.00 (g/mL) mL Lab File ID: HP07159.i/04mar18a.b/nm18b01.d

Level: (low/med) LOW Date Received:

Moisture: not dec. _____ Date Analyzed: 03/18/04

Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)	MDL ug/L	Q
591-78-6	2-Hexanone		3	U
124-48-1	Dibromochloromethane		1	U
106-93-4	1,2-Dibromoethane		1	U
1330-20-7	Xylene (Total)		0.8	U
108-90-7	Chlorobenzene		0.8	U
630-20-6	1,1,1,2-Tetrachloroethane		1	U
100-41-4	Ethylbenzene		0.8	U
1330-20-7	m+p-Xylene		0.8	U
95-47-6	o-Xylene		0.8	U
100-42-5	Styrene		1	U
75-25-2	Bromoform		1	U
98-82-8	Isopropylbenzene		1	U
108-94-1	Cyclohexanone		55	U
79-34-5	1,1,2,2-Tetrachloroethane		1	U
110-57-6	trans-1,4-Dichloro-2-Butene		15	U
108-86-1	Bromobenzene		1	U
96-18-4	1,2,3-Trichloropropane		1	U
103-65-1	n-Propylbenzene		1	U
95-49-8	2-Chlorotoluene		1	U
108-67-8	1,3,5-Trimethylbenzene		1	U
106-43-4	4-Chlorotoluene		1	U
98-06-6	tert-Butylbenzene		1	U
76-01-7	Pentachloroethane		1	U
95-63-6	1,2,4-Trimethylbenzene		1	U
135-98-8	sec-Butylbenzene		1	U
99-87-6	p-Isopropyltoluene		1	U
541-73-1	1,3-Dichlorobenzene		1	U
106-46-7	1,4-Dichlorobenzene		1	U
104-51-8	n-Butylbenzene		1	U
95-50-1	1,2-Dichlorobenzene		1	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKN64

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Matrix: (soil/water) WATER Lab Sample ID: VBLKN64

Sample wt/vol: 5.00 (g/mL) mL Lab File ID: HP07159.i/04mar18a.b/nm18b01.d

Level: (low/med) LOW Date Received:

Moisture: not dec. _____ Date Analyzed: 03/18/04

Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)	MDL ug/L	Q
96-12-8	1,2-Dibromo-3-Chloropropane		2	U
120-82-1	1,2,4-Trichlorobenzene		1	U
87-68-3	Hexachlorobutadiene		2	U
91-20-3	Naphthalene		1	J
87-61-6	1,2,3-Trichlorobenzene		1	U

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID: nm18b01.d Lab Sample ID: VBLKN64

Date Analyzed: 03/18/04 Time Analyzed: 13:58

Matrix (soil/water) WATER Level: (low/med) LOW

Instrument ID: HP07159

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	LCSN64	LCSN64	nm18s01.d	14:23
02	EXBLKB	4235599	nm18s02.d	14:48
03	TSTPZ	4234111	nm18s03.d	15:13
04	TSTPZMS	4234111	nm18s04.d	15:38
05	TSTPZMSD	4234111	nm18s05.d	16:03
06	ZH315	4235000	nm18s06.d	16:28
07	EXBLKC	4232992	nm18s07.d	16:53
08	ZSOIL	4231735	nm18s08.d	17:19
09	ZHCAR	4231738	nm18s09.d	17:44
10	ZHCARMS	4231738	nm18s10.d	18:09
11	ZH597	4231979	nm18s11.d	18:34
12	ZH598	4231983	nm18s12.d	18:59
13	EXBLKD	4231344	nm18s14.d	19:50
14	WCCRZ	4230646	nm18s15.d	20:15
15	WCCRZMS	4230646	nm18s16.d	20:40
16	EXBLKE	4234768	nm18s17.d	21:06
17	ZH458	4232621	nm18s18.d	21:30
18	Z6464	4234382	nm18s19.d	21:55
19	Z6466	4234389	nm18s20.d	22:20
20	Z6465	4234393	nm18s21.d	22:45
21	459ZH	4232627	nm18s22.d	23:10
22	459ZHMS	4232627	nm18s23.d	23:35

COMMENTS:

Lancaster Laboratories, Inc.
GC/MS Volatiles Matrix Spike/Spike Duplicate Recoveries

Unspiked: nm18s03.d
TSTPZ 4234111
Method: SW-846 8260B
Instrument: HP07159

Matrix Spike: nm18s04.d
TSTPZMS 4234111
Matrix/Level: WL
Dilution Factor: 20.00

Spike Duplicate: nm18s05.d
TSTPZMSD 4234111
Batch: N040781AB

COMPOUND NAME	MS SPIKE	MSD SPIKE	US CONC UG/L	MS CONC UG/L	MSD CONC UG/L	MS REC %	MSD REC %	Range LOWER-UPPER	INSPEC	RPD %	RPD MAX
Vinyl Chloride	400.0	400.0	ND	437	435	109	109	70-151	YES	0	30
1,1-Dichloroethene	400.0	400.0	ND	406	407	101	102	78-146	YES	0	30
Freon 113	400.0	400.0	ND	434	443	108	111	73-166	YES	2	30
Carbon Disulfide	400.0	400.0	ND	423	430	106	107	77-155	YES	2	30
Methylene Chloride	400.0	400.0	ND	417	407	104	102	79-133	YES	2	30
2-Butanone	3000.0	3000.0	ND	1830	1830	61	61	42-140	YES	0	30
Chloroform	400.0	400.0	ND	419	422	105	106	82-131	YES	1	30
Carbon Tetrachloride	400.0	400.0	ND	429	434	107	108	73-144	YES	1	30
Isobutyl Alcohol	10000.0	10000.0	ND	6710	6520	67	65	51-140	YES	3	30
Benzene	400.0	400.0	ND	420	413	105	103	83-128	YES	2	30
1,2-Dichloroethane	400.0	400.0	ND	420	413	105	103	73-136	YES	2	30
Trichloroethene	400.0	400.0	ND	416	418	104	105	75-135	YES	0	30
Toluene	400.0	400.0	ND	400	399	100	100	83-127	YES	0	30
Tetrachloroethene	400.0	400.0	ND	433	441	108	110	75-143	YES	2	30
Chlorobenzene	400.0	400.0	ND	406	410	102	102	83-120	YES	0	30
Ethylbenzene	400.0	400.0	85.6	494	495	102	102	82-129	YES	0	30
m+p-Xylene	800.0	800.0	281	1100	1120	102	104	82-130	YES	2	30
o-Xylene	400.0	400.0	ND	413	419	103	105	82-130	YES	1	30
Cyclohexanone	10000.0	10000.0	ND	5840	5780	58	58	21-139	YES	0	30
1,4-Dichlorobenzene	400.0	400.0	ND	419	417	105	104	81-122	YES	1	30
1,2-Dichlorobenzene	400.0	400.0	ND	421	416	105	104	82-117	YES	1	30

N/C = Could not calculate

Ent. by _____

Lab Chronicle: _____

Ver. by _____

Lancaster Laboratories, Inc.
GC/MS Volatiles Laboratory Control Sample Recovery

File: nm18s01.d
Inst: HP07159
Dilution Factor: 1.0

Injected: 03/18/04 at 14:23
Sample: LCSN64

Method: SW-846 8260B
Matrix/Level: WL
Batch: N040781AA

COMPOUND NAME	SPIKE LEVEL	LCS CONC UG/L	LCS REC %	Range LOWER-UPPER	INSPEC
Dichlorodifluoromethane	20.00	25.41	127	56-172	YES
Chloromethane	20.00	21.20	106	69-136	YES
Vinyl Chloride	20.00	20.19	101	71-129	YES
Bromomethane	20.00	21.46	107	46-138	YES
Chloroethane	20.00	20.74	104	59-133	YES
Trichlorofluoromethane	20.00	20.84	104	59-137	YES
Ethanol	500.00	352.14	70	46-145	YES
Acrolein	150.00	108.86	73	28-146	YES
1,1-Dichloroethene	20.00	20.97	105	79-130	YES
Freon 113	20.00	22.22	111	73-140	YES
Acetone	150.00	113.59	76	22-179	YES
Methyl Iodide	20.00	21.80	109	74-133	YES
2-Propanol	150.00	96.27	64	54-162	YES
Carbon Disulfide	20.00	21.97	110	73-143	YES
Allyl Chloride	20.00	16.81	84	40-136	YES
Methylene Chloride	20.00	20.99	105	80-128	YES
t-Butyl Alcohol	200.00	139.47	70	57-141	YES
Acrylonitrile	100.00	73.15	73	64-126	YES
trans-1,2-Dichloroethene	20.00	21.34	107	81-124	YES
Methyl Tertiary Butyl Ether	20.00	20.81	104	77-127	YES
n-Hexane	20.00	22.50	112	67-141	YES
1,2-Dichloroethene (total)	40.00	42.57	106	84-117	YES
1,1-Dichloroethane	20.00	20.57	103	83-127	YES
di-Isopropyl Ether	20.00	20.78	104	67-130	YES
2-Chloro-1,3-Butadiene	20.00	22.97	115	71-142	YES
Ethyl t-Butyl Ether	20.00	21.43	107	74-120	YES
cis-1,2-Dichloroethene	20.00	21.23	106	84-117	YES
2-Butanone	150.00	122.27	82	45-154	YES
2,2-Dichloropropane	20.00	22.01	110	79-123	YES
Propionitrile	150.00	112.86	75	73-128	YES
Methacrylonitrile	150.00	125.46	84	79-124	YES
Bromochloromethane	20.00	18.36	92	63-125	YES
Tetrahydrofuran	100.00	81.63	82	73-131	YES
Chloroform	20.00	21.46	107	86-124	YES
1,1,1-Trichloroethane	20.00	21.80	109	83-127	YES
Cyclohexane	20.00	21.78	109	76-128	YES
1,1-Dichloropropene	20.00	21.04	105	84-116	YES
Carbon Tetrachloride	20.00	22.27	111	77-130	YES
Isobutyl Alcohol	500.00	341.46	68	59-134	YES
Benzene	20.00	21.22	106	85-117	YES
1,2-Dichloroethane	20.00	21.19	106	77-132	YES
t-Amyl Methyl Ether	20.00	20.86	104	79-113	YES
n-Heptane	20.00	21.70	109	64-136	YES
n-Butanol	1000.00	609.58	61	50-133	YES
Trichloroethene	20.00	21.20	106	87-117	YES
1,2-Dichloropropane	20.00	21.02	105	80-117	YES
Methyl Methacrylate	20.00	17.74	89	73-113	YES
Dibromomethane	20.00	20.65	103	87-117	YES
1,4-Dioxane	500.00	305.22	61	41-155	YES
Bromodichloromethane	20.00	21.11	106	83-121	YES
2-Nitropropane	20.00	15.80	79	37-150	YES
2-Chloroethyl Vinyl Ether	20.00	19.12	96	60-129	YES
cis-1,3-Dichloropropene	20.00	20.90	105	78-114	YES
4-Methyl-2-Pentanone	100.00	78.84	79	65-125	YES
Toluene	20.00	20.05	100	85-115	YES
trans-1,3-Dichloropropene	20.00	19.66	98	79-114	YES
Ethyl Methacrylate	20.00	17.92	90	77-118	YES
1,1,2-Trichloroethane	20.00	19.28	96	86-113	YES

N/C = Could not calculate

Ent. by _____

Lab Chronicle: _____

Ver. by _____

Lancaster Laboratories, Inc.
GC/MS Volatiles Laboratory Control Sample Recovery

File: nm18s01.d
Inst: HP07159
Dilution Factor: 1.0

Injected: 03/18/04 at 14:23
Sample: LCSN64

Method: SW-846 8260B
Matrix/Level: WL
Batch: WN040781AA

COMPOUND NAME	SPIKE LEVEL	LCS CONC UG/L	LCS REC %	Range LOWER-UPPER	INSPEC
Tetrachloroethene	20.00	22.14	111	82-126	YES
1,3-Dichloropropane	20.00	19.18	96	84-119	YES
2-Hexanone	100.00	78.39	78	47-150	YES
Dibromochloromethane	20.00	19.59	98	78-119	YES
1,2-Dibromoethane	20.00	18.92	95	81-114	YES
Chlorobenzene	20.00	20.29	101	85-115	YES
1,1,1,2-Tetrachloroethane	20.00	20.65	103	83-114	YES
Ethylbenzene	20.00	20.80	104	82-119	YES
m+p-Xylene	40.00	41.65	104	84-120	YES
Xylene (Total)	60.00	62.40	104	84-120	YES
o-Xylene	20.00	20.75	104	84-120	YES
Styrene	20.00	20.02	100	84-117	YES
Bromoform	20.00	18.30	91	69-118	YES
Isopropylbenzene	20.00	21.24	106	80-120	YES
Cyclohexanone	500.00	279.18	56	19-158	YES
1,1,2,2-Tetrachloroethane	20.00	17.37	87	72-119	YES
trans-1,4-Dichloro-2-Butene	100.00	77.80	78	50-140	YES
Bromobenzene	20.00	20.36	102	80-118	YES
1,2,3-Trichloropropane	20.00	16.58	83	78-117	YES
n-Propylbenzene	20.00	21.01	105	78-119	YES
2-Chlorotoluene	20.00	20.70	103	78-115	YES
1,3,5-Trimethylbenzene	20.00	20.92	105	78-116	YES
4-Chlorotoluene	20.00	21.05	105	80-112	YES
tert-Butylbenzene	20.00	20.70	104	74-114	YES
Pentachloroethane	20.00	18.01	90	63-116	YES
1,2,4-Trimethylbenzene	20.00	20.81	104	78-117	YES
sec-Butylbenzene	20.00	20.69	103	72-120	YES
p-Isopropyltoluene	20.00	20.25	101	72-118	YES
1,3-Dichlorobenzene	20.00	20.94	105	81-114	YES
1,4-Dichlorobenzene	20.00	21.16	106	84-116	YES
n-Butylbenzene	20.00	20.24	101	70-116	YES
1,2-Dichlorobenzene	20.00	21.02	105	81-112	YES
1,2-Dibromo-3-Chloropropane	20.00	14.28	71	59-120	YES
1,2,4-Trichlorobenzene	20.00	17.78	89	65-114	YES
Hexachlorobutadiene	20.00	18.68	93	56-120	YES
Naphthalene	20.00	14.75	74	61-116	YES
1,2,3-Trichlorobenzene	20.00	16.31	82	67-114	YES

N/C = Could not calculate

Lab Chronicle: _____ Ent. by _____

_____ Ver. by _____

8A

VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID (Standard): nm18c01.d Date Analyzed: 03/18/04

Instrument ID: HP07159 Time Analyzed: 13:08

Matrix: (soil/water) WATER Level: (low/med) LOW Column: (pack/cap) CAP

		IS1(FBZ) AREA #	RT #	IS2(CBZ) AREA #	RT #	IS3(DCB) AREA #	RT #
	12 HOUR STD	995762	7.970	787324	11.352	435296	13.203
	UPPER LIMIT	1991524	8.470	1574648	11.852	870592	13.703
	LOWER LIMIT	497881	7.470	393662	10.852	217648	12.703
	EPA SAMPLE NO.						
01	VBLKN64	986142	7.972	782186	11.351	401793	13.203
02	LCSN64	983225	7.966	787206	11.351	424401	13.200
03	EXBLKB	980121	7.968	775135	11.350	397694	13.198
04	TSTPZ	976215	7.973	780990	11.352	406930	13.200
05	TSTPZMS	979762	7.969	781758	11.348	421999	13.203
06	TSTPZMSD	993937	7.969	786831	11.351	430924	13.202
07	ZH315	975998	7.972	780510	11.354	398549	13.203
08	EXBLKC	951891	7.968	754992	11.353	384100	13.201
09	ZSOIL	972852	7.973	777846	11.352	399550	13.203
10	ZHCAR	980510	7.969	774682	11.354	394436	13.202
11	ZHCARMS	963408	7.967	769082	11.352	423288	13.200
12	ZH597	980793	7.969	775682	11.351	397459	13.200
13	ZH598	967916	7.968	768858	11.354	390467	13.202
14	EXBLKD	955105	7.967	763753	11.352	382188	13.200
15	WCCRZ	904513	7.970	724462	11.352	360927	13.200
16	WCCRZMS	904583	7.970	728259	11.352	395908	13.200
17	EXBLKE	923713	7.970	733464	11.352	366444	13.204
18	ZH458	870650	7.972	701059	11.351	352881	13.202
19	Z6464	938394	7.970	748464	11.352	377482	13.203
20	Z6466	923272	7.967	735251	11.349	368886	13.200
21	Z6465	898429	7.966	717254	11.351	359524	13.200
22	459ZH	920373	7.969	732794	11.354	381802	13.202

IS1 (FBZ)=Fluorobenzene
IS2 (CBZ)=Chlorobenzene-d5
IS3 (DCB)=1,4-Dichlorobenzene-d4

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag values outside QC limits with an asterisk
* Values outside of QC limits.

8A

VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID (Standard): nm18c01.d Date Analyzed: 03/18/04

Instrument ID: HP07159 Time Analyzed: 13:08

Matrix: (soil/water) WATER Level: (low/med) LOW Column: (pack/cap) CAP

	IS1(FBZ) AREA #	RT #	IS2(CBZ) AREA #	RT #	IS3(DCB) AREA #	RT #
12 HOUR STD	995762	7.970	787324	11.352	435296	13.203
UPPER LIMIT	1991524	8.470	1574648	11.852	870592	13.703
LOWER LIMIT	497881	7.470	393662	10.852	217648	12.703
EPA SAMPLE NO.						
23 459ZHMS	866399	7.969	703475	11.351	378534	13.199

IS1 (FBZ)=Fluorobenzene
IS2 (CBZ)=Chlorobenzene-d5
IS3 (DCB)=1,4-Dichlorobenzene-d4

UPPER LIMIT = + 100%
of internal standard area.
LOWER LIMIT = - 50%
of internal standard area.

Column used to flag values outside QC limits with an asterisk
* Values outside of QC limits.

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP07159 Calibration Date(s): 03/10/04 03/10/04

Heated Purge: (Y/N) Y Calibration Times: 10:54 14:52

Matrix: (soil/water) WATER Level: (low/med) LOW GC Column: DB-624 ID: .25

LAB FILE ID: RRF 4 = nm10i18.d RRF 10= nm10i15.d RRF 20= nm10i14.d
RRF 50= nm10i13.d RRF100= nm10i17.d RRF300= nm10i11.d RRF =

COMPOUND	RRF 4	RRF 10	RRF 20	RRF 50	RRF100	RRF300	RRF	$\overline{RRF}$	% RSD	CAL. METHOD	
Dichlorodifluoromethane	0.3543	0.3392	0.3823	0.3544	0.3482	0.3513		0.3549	4	AVG	
Chloromethane	#0.3455	0.3174	0.3631	0.3573	0.3250	0.3184		0.3378	6	AVG	#
Vinyl Chloride	*0.3353	0.3056	0.3340	0.3231	0.3101	0.3036		0.3186	4	AVG	*
Bromomethane	0.2002	0.1861	0.2157	0.2062	0.2006	0.2089		0.2030	5	AVG	
Chloroethane	0.1714	0.1688	0.1880	0.1822	0.1739	0.1775		0.1770	4	AVG	
Trichlorofluoromethane	0.4315	0.4016	0.4638	0.4385	0.4277	0.4283		0.4319	5	AVG	
Ethanol	0.0019	0.0019	0.0018	0.0019	0.0018	0.0022		0.0019	7	AVG	
Acrolein	0.0754	0.0778	0.0841	0.0968	0.0915	0.0871		0.0855	10	AVG	
1,1-Dichloroethene	*0.2226	0.2317	0.2197	0.2236	0.2144	0.2189		0.2218	3	AVG	*
Freon 113	0.1571	0.2284	0.2201	0.2216	0.2131	0.2159		0.2094	12	AVG	
Acetone	0.0523	0.0535	0.0558	0.0647	0.0576	0.0550		0.0565	8	AVG	
Methyl Iodide	0.3435	0.4287	0.4184	0.4247	0.4125	0.4119		0.4066	8	AVG	
2-Propanol	0.0311	0.0353	0.0327	0.0341	0.0313	0.0338		0.0331	5	AVG	
Carbon Disulfide	0.6362	0.7553	0.7275	0.7328	0.7095	0.7189		0.7134	6	AVG	
Allyl Chloride	0.4370	0.4601	0.4235	0.4437	0.4232	0.4220		0.4349	3	AVG	
Methylene Chloride	0.2228	0.2688	0.2510	0.2583	0.2491	0.2455		0.2492	6	AVG	
t-Butyl Alcohol	0.0593	0.0632	0.0591	0.0597	0.0576	0.0590		0.0596	3	AVG	
Acrylonitrile	0.1411	0.1417	0.1533	0.1713	0.1604	0.1508		0.1531	8	AVG	
trans-1,2-Dichloroethene	0.2316	0.2661	0.2533	0.2542	0.2464	0.2442		0.2493	5	AVG	
Methyl Tertiary Butyl Ether	0.8204	0.9070	0.8590	0.8738	0.8496	0.8481		0.8596	3	AVG	
n-Hexane	0.1707	0.2467	0.2443	0.2521	0.2417	0.2301		0.2309	13	AVG	
1,2-Dichloroethene (total)	0.2417	0.2755	0.2641	0.2655	0.2572	0.2551		0.2598	4	AVG	
1,1-Dichloroethane	#0.4150	0.4901	0.4625	0.4642	0.4488	0.4462		0.4545	5	AVG	#
di-Isopropyl Ether	0.7636	0.9162	0.8789	0.8847	0.8632	0.8642		0.8618	6	AVG	
2-Chloro-1,3-Butadiene	0.3218	0.3859	0.3652	0.3807	0.3697	0.3764		0.3666	6	AVG	
Ethyl t-Butyl Ether	0.7444	0.9049	0.8470	0.8552	0.8362	0.8339		0.8369	6	AVG	
cis-1,2-Dichloroethene	0.2517	0.2850	0.2749	0.2768	0.2680	0.2661		0.2704	4	AVG	
2-Butanone	0.0570	0.0567	0.0632	0.0731	0.0666	0.0631		0.0633	10	AVG	
2,2-Dichloropropane	0.3729	0.4142	0.4177	0.4198	0.4010	0.3984		0.4040	4	AVG	
Propionitrile	0.0573	0.0629	0.0604	0.0606	0.0583	0.0583		0.0596	3	AVG	
Methacrylonitrile	0.1486	0.1696	0.1595	0.1590	0.1558	0.1554		0.1580	4	AVG	
Bromochloromethane	0.1443	0.1613	0.1576	0.1517	0.1457	0.1454		0.1510	5	AVG	
Tetrahydrofuran	0.0535	0.0469	0.0503	0.0564	0.0537	0.0489		0.0516	7	AVG	
Chloroform	*0.4037	0.4723	0.4571	0.4580	0.4444	0.4388		0.4457	5	AVG	*
1,1,1-Trichloroethane	0.3650	0.4326	0.4135	0.4183	0.4042	0.3997		0.4055	6	AVG	
Cyclohexane	0.2347	0.3737	0.3663	0.3718	0.3515	0.3431		0.3402	16	ZNDDEG	
1,1-Dichloropropene	0.3026	0.3501	0.3427	0.3427	0.3306	0.3309		0.3333	5	AVG	
Carbon Tetrachloride	0.3118	0.3762	0.3620	0.3760	0.3597	0.3600		0.3576	7	AVG	
Isobutyl Alcohol	0.0179	0.0201	0.0188	0.0191	0.0182	0.0186		0.0188	4	AVG	
Benzene	0.9216	1.0591	1.0113	1.0252	0.9933	0.9898		1.0000	5	AVG	
1,2-Dichloroethane	0.3538	0.4157	0.4028	0.4099	0.3989	0.3964		0.3963	6	AVG	
1,2-Dichloroethane (mz 98)	0.0312	0.0379	0.0353	0.0341	0.0327	0.0323		0.0339	7	AVG	
t-Amyl Methyl Ether	0.7735	0.9040	0.8485	0.8441	0.8192	0.8081		0.8329	5	AVG	
n-Heptane	0.0419	0.0423	0.0439	0.0415	0.0415	0.0388		0.0416	4	AVG	
n-Butanol	0.0143	0.0160	0.0150	0.0151	0.0144	0.0156		0.0151	4	AVG	
Trichloroethene	0.2429	0.2829	0.2699	0.2703	0.2587	0.2579		0.2638	5	AVG	
1,2-Dichloropropane	*0.2421	0.2864	0.2748	0.2779	0.2692	0.2676		0.2697	6	AVG	*
Methyl Methacrylate	0.2390	0.2854	0.2656	0.2740	0.2694	0.2728		0.2677	6	AVG	
Dibromomethane	0.1551	0.1987	0.1897	0.1937	0.1881	0.1873		0.1854	8	AVG	
1,4-Dioxane	0.0043	0.0048	0.0043	0.0047	0.0039	0.0046		0.0044	7	AVG	
Bromodichloromethane	0.3048	0.3630	0.3503	0.3549	0.3440	0.3456		0.3437	6	AVG	
2-Nitropropane	0.1220	0.1234	0.1331	0.1565	0.1457	0.1369		0.1363	10	AVG	

Minimum RRF for SPCC(#) = 0.10
(0.30 for Chlorobenzene, 1,1,2,2-Tetrachloroethane)
Maximum %RSD for CCC(*) = 30%

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP07159 Calibration Date(s): 03/10/04 03/10/04

Heated Purge: (Y/N) Y Calibration Times: 10:54 14:52

Matrix: (soil/water) WATER Level: (low/med) LOW GC Column: DB-624 ID: .25

LAB FILE ID: RRF 4 = nm10i18.d RRF 10= nm10i15.d RRF 20= nm10i14.d
RRF 50= nm10i13.d RRF100= nm10i17.d RRF300= nm10i11.d RRF =

COMPOUND	RRF 4	RRF 10	RRF 20	RRF 50	RRF100	RRF300	RRF	$\overline{RRF}$	% RSD	CAL. METHOD
2-Chloroethyl Vinyl Ether	0.1444	0.1768	0.1858	0.1984	0.1930	0.1942		0.1821	11	AVG
cis-1,3-Dichloropropene	0.4082	0.4888	0.4632	0.4715	0.4610	0.4620		0.4591	6	AVG
4-Methyl-2-Pentanone	0.4070	0.4186	0.4539	0.5272	0.4979	0.4684		0.4622	10	AVG
Toluene	*0.7580	0.9129	0.8736	0.8711	0.8405	0.8339		0.8483	6	AVG
trans-1,3-Dichloropropene	0.4967	0.6072	0.5898	0.5902	0.5825	0.5874		0.5756	7	AVG
Ethyl Methacrylate	0.5037	0.6081	0.5988	0.6096	0.5981	0.5901		0.5847	7	AVG
1,1,2-Trichloroethane	0.3102	0.3444	0.3398	0.3405	0.3312	0.3250		0.3318	4	AVG
Tetrachloroethene	0.2945	0.4061	0.3789	0.3782	0.3641	0.3515		0.3622	10	AVG
1,3-Dichloropropane	0.5427	0.6330	0.6029	0.6011	0.5916	0.5960		0.5945	5	AVG
2-Hexanone	0.4101	0.4310	0.4697	0.5481	0.5091	0.4838		0.4753	11	AVG
Dibromochloromethane	0.3629	0.4229	0.4168	0.4259	0.4110	0.4114		0.4085	6	AVG
1,2-Dibromoethane	0.3415	0.4013	0.3832	0.3900	0.3773	0.3748		0.3780	5	AVG
Chlorobenzene	#0.8355	1.0303	0.9812	0.9720	0.9483	0.9436		0.9518	7	AVG #
1,1,1,2-Tetrachloroethane	0.3036	0.3803	0.3658	0.3648	0.3582	0.3566		0.3549	7	AVG
Ethylbenzene	*1.2152	1.6525	1.6054	1.6045	1.5556	1.5086		1.5236	10	AVG *
m+p-Xylene	0.4597	0.6539	0.6241	0.6242	0.6068	0.5994		0.5947	12	AVG
Xylene (Total)	0.4586	0.6470	0.6211	0.6198	0.6030	0.5953		0.5908	11	AVG
o-Xylene	0.4562	0.6334	0.6152	0.6111	0.5954	0.5870		0.5830	11	AVG
Styrene	0.7899	1.0829	1.0618	1.0870	1.0647	1.0726		1.0265	11	AVG
Bromoform	#0.2803	0.3550	0.3495	0.3567	0.3531	0.3551		0.3416	9	AVG #
Isopropylbenzene	0.9961	1.4992	1.4705	1.4602	1.4060	1.3055		1.3563	14	AVG
Cyclohexanone	0.0199	0.0213	0.0207	0.0220	0.0200	0.0224		0.0210	5	AVG
1,1,2,2-Tetrachloroethane	#0.9867	1.1387	1.0849	1.0427	1.0062	0.9925		1.0419	6	AVG #
trans-1,4-Dichloro-2-Butene	0.3237	0.3790	0.3690	0.3670	0.3693	0.3909		0.3665	6	AVG
Bromobenzene	0.7040	0.9013	0.8492	0.8344	0.8035	0.7928		0.8142	8	AVG
1,2,3-Trichloropropane	0.3002	0.3463	0.3350	0.3296	0.3187	0.3136		0.3239	5	AVG
n-Propylbenzene	2.2072	3.1640	3.0778	3.0603	2.8907	2.6360		2.8393	13	AVG
2-Chlorotoluene	0.5039	0.7442	0.7051	0.6854	0.6623	0.6195		0.6534	13	AVG
1,3,5-Trimethylbenzene	1.5755	2.2767	2.1613	2.1692	2.0662	1.9304		2.0299	12	AVG
4-Chlorotoluene	0.5433	0.7775	0.7358	0.7172	0.6875	0.6552		0.6861	12	AVG
tert-Butylbenzene	0.4036	0.5257	0.4947	0.4888	0.4687	0.4328		0.4690	9	AVG
Pentachloroethane	0.5435	0.5835	0.5406	0.5440	0.5208	0.5194		0.5420	4	AVG
1,2,4-Trimethylbenzene	1.5912	2.3676	2.2884	2.2679	2.1653	2.0619		2.1237	13	AVG
sec-Butylbenzene	1.9574	2.4226	2.3890	2.3823	2.2926	2.0661		2.2517	9	AVG
p-Isopropyltoluene	1.7639	2.1876	2.1523	2.1431	2.0490	1.9281		2.0373	8	AVG
1,3-Dichlorobenzene	0.9968	1.4632	1.3935	1.3835	1.3289	1.2810		1.3078	13	AVG
1,4-Dichlorobenzene	1.0780	1.5150	1.4770	1.4554	1.3944	1.3331		1.3755	12	AVG
n-Butylbenzene	1.4722	1.7549	1.7535	1.7520	1.7007	1.5760		1.6682	7	AVG
1,2-Dichlorobenzene	1.0152	1.4285	1.3767	1.3582	1.3265	1.2713		1.2961	11	AVG
1,2-Dibromo-3-Chloropropane	0.1938	0.2441	0.2437	0.2390	0.2361	0.2348		0.2319	8	AVG
1,2,4-Trichlorobenzene	0.3454	0.6361	0.6909	0.7712	0.7522	0.7183		0.6524	24	1STDEG
Hexachlorobutadiene	0.3408	0.3618	0.3648	0.3514	0.3366	0.2992		0.3424	7	AVG
Naphthalene	1.0664	2.1558	2.3754	2.6768	2.6584	2.5957		2.2548	27	1STDEG
1,2,3-Trichlorobenzene	0.3660	0.6004	0.6706	0.7252	0.7004	0.6603		0.6205	21	1STDEG
Dibromofluoromethane	0.2827	0.2573	0.2591	0.2561	0.2583	0.2567		0.2617	4	AVG
1,2-Dichloroethane-d4	0.0676	0.0618	0.0622	0.0628	0.0611	0.0616		0.0628	4	AVG
Dibromofluoromethane(mz111)	0.2827	0.2632	0.2631	0.2627	0.2593	0.2594		0.2650	3	AVG
1,2-Dichloroethane-d4(mz104)	0.0460	0.0412	0.0401	0.0401	0.0393	0.0392		0.0410	6	AVG
Toluene-d8(mz100)	0.9634	0.8450	0.8465	0.8297	0.8253	0.8305		0.8567	6	AVG
4-Bromofluorobenzene(mz174)	0.4898	0.4171	0.4208	0.4235	0.4192	0.4219		0.4320	7	AVG
Toluene-d8	1.4491	1.2498	1.2683	1.2573	1.2532	1.2617		1.2899	6	AVG

Minimum RRF for SPCC(#) = 0.10
(0.30 for Chlorobenzene, 1,1,2,2-Tetrachloroethane)
Maximum %RSD for CCC(*) = 30%

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP07159 Calibration Date(s): 03/10/04 03/10/04

Heated Purge: (Y/N) Y Calibration Times: 10:54 14:52

Matrix: (soil/water) WATER Level: (low/med) LOW GC Column: DB-624 ID: .25

LAB FILE ID: RRF 4 = nm10i18.d RRF 10= nm10i15.d RRF 20= nm10i14.d
RRF 50= nm10i13.d RRF100= nm10i17.d RRF300= nm10i11.d RRF =

COMPOUND	RRF 4	RRF 10	RRF 20	RRF 50	RRF100	RRF300	RRF	$\overline{RRF}$	% RSD	CAL. METHOD
4-Bromofluorobenzene	0.5562	0.4692	0.4649	0.4600	0.4550	0.4635		0.4781	8	AVG

Average %RSD 8

Minimum RRF for SPCC(#) = 0.10
(0.30 for Chlorobenzene, 1,1,2,2-Tetrachloroethane)
Maximum %RSD for CCC(*) = 30%

7A

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP07159 Calibration Date: 03/18/04 Time: 13:08

Lab File ID: nm18c01.d Init. Calib. Date(s): 03/10/04 03/10/04

Matrix: (soil/water) WATER Level: (low/med) LOW GC Column: DB-624 ID: .25

	COMPOUND	RRF	RRF100	ACTUAL CONC.	TRUE CONC.	% DRIFT	
	Dichlorodifluoromethane	0.3549	0.3485	98.20	100	-2	
#	Chloromethane	0.3378	0.3192	94.51	100	-5	#
*	Vinyl Chloride	0.3186	0.3109	97.58	100	-2	*
	Bromomethane	0.2030	0.1994	98.26	100	-2	
	Chloroethane	0.1770	0.1721	97.26	100	-3	
	Trichlorofluoromethane	0.4319	0.4576	105.94	100	6	
	Ethanol	0.0019	0.0014	1893.13	2500	-24	
	Acrolein	0.0855	0.0650	760.75	1000	-24	
*	1,1-Dichloroethene	0.2218	0.2321	104.64	100	5	*
	Freon 113	0.2094	0.2087	99.65	100	0	
	Acetone	0.0565	0.0308	109.18	200	-45	
	Methyl Iodide	0.4066	0.4612	113.43	100	13	
	2-Propanol	0.0331	0.0245	370.23	500	-26	
	Carbon Disulfide	0.7134	0.7823	109.66	100	10	
	Allyl Chloride	0.4349	0.4130	94.95	100	-5	
	Methylene Chloride	0.2492	0.2666	106.97	100	7	
	t-Butyl Alcohol	0.0596	0.0436	365.31	500	-27	
	Acrylonitrile	0.1531	0.1185	77.43	100	-23	
	trans-1,2-Dichloroethene	0.2493	0.2679	107.48	100	7	
	Methyl Tertiary Butyl Ether	0.8596	0.9119	106.08	100	6	
	n-Hexane	0.2309	0.2489	107.80	100	8	
	1,2-Dichloroethene (total)	0.2598	0.2802	215.61	200	8	
#	1,1-Dichloroethane	0.4545	0.4872	107.20	100	7	#
	di-Isopropyl Ether	0.8618	0.9203	106.79	100	7	
	2-Chloro-1,3-Butadiene	0.3666	0.3733	101.83	100	2	
	Ethyl t-Butyl Ether	0.8369	0.9112	108.87	100	9	
	cis-1,2-Dichloroethene	0.2704	0.2924	108.13	100	8	
	2-Butanone	0.0633	0.0430	135.77	200	-32	
	2,2-Dichloropropane	0.4040	0.4375	108.30	100	8	
	Propionitrile	0.0596	0.0446	373.74	500	-25	
	Methacrylonitrile	0.1580	0.1328	210.08	250	-16	
	Bromochloromethane	0.1510	0.1559	103.28	100	3	
	Tetrahydrofuran	0.0516	0.0381	147.78	200	-26	
*	Chloroform	0.4457	0.4821	108.17	100	8	*
	1,1,1-Trichloroethane	0.4055	0.4243	104.61	100	5	
	Cyclohexane	0.3402	0.3289	92.25	100	-8	

Minimum RRF for SPCC(#)=0.10 (0.30 for Chlorobenzene, 1,1,2,2-Tetrachloroethane)
Maximum %Drift for CCC(*)=20%

7A

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP07159 Calibration Date: 03/18/04 Time: 13:08

Lab File ID: nm18c01.d Init. Calib. Date(s): 03/10/04 03/10/04

Matrix: (soil/water) WATER Level: (low/med) LOW GC Column: DB-624 ID: .25

	COMPOUND	RRF	RRF100	ACTUAL CONC.	TRUE CONC.	% DRIFT	
	1,1-Dichloropropene	0.3333	0.3342	100.27	100	0	
	Carbon Tetrachloride	0.3576	0.3675	102.75	100	3	
	Isobutyl Alcohol	0.0188	0.0136	908.14	1250	-27	
	Benzene	1.0000	1.0468	104.67	100	5	
	1,2-Dichloroethane	0.3963	0.4243	107.08	100	7	
	1,2-Dichloroethane (mz 98)	0.0339	0.0354	104.34	100	4	
	t-Amyl Methyl Ether	0.8329	0.8892	106.76	100	7	
	n-Heptane	0.0416	0.0539	129.34	100	29	
	n-Butanol	0.0151	0.0107	1768.45	2500	-29	
	Trichloroethene	0.2638	0.2699	102.33	100	2	
*	1,2-Dichloropropane	0.2697	0.2802	103.90	100	4	*
	Methyl Methacrylate	0.2677	0.2446	91.36	100	-9	
	Dibromomethane	0.1854	0.1956	105.48	100	5	
	1,4-Dioxane	0.0044	0.0034	960.62	1250	-23	
	Bromodichloromethane	0.3437	0.3727	108.44	100	8	
	2-Nitropropane	0.1363	0.1139	167.11	200	-16	
	2-Chloroethyl Vinyl Ether	0.1821	0.1820	99.94	100	0	
	cis-1,3-Dichloropropene	0.4591	0.4865	105.96	100	6	
	4-Methyl-2-Pentanone	0.4622	0.3754	162.45	200	-19	
*	Toluene	0.8483	0.8247	97.22	100	-3	*
	trans-1,3-Dichloropropene	0.5756	0.5836	101.38	100	1	
	Ethyl Methacrylate	0.5847	0.5421	92.72	100	-7	
	1,1,2-Trichloroethane	0.3318	0.3255	98.09	100	-2	
	Tetrachloroethene	0.3622	0.3471	95.82	100	-4	
	1,3-Dichloropropane	0.5945	0.5726	96.31	100	-4	
	2-Hexanone	0.4753	0.3463	145.71	200	-27	
	Dibromochloromethane	0.4085	0.4219	103.28	100	3	
	1,2-Dibromoethane	0.3780	0.3626	95.93	100	-4	
#	Chlorobenzene	0.9518	0.9433	99.11	100	-1	#
	1,1,1,2-Tetrachloroethane	0.3549	0.3617	101.91	100	2	
*	Ethylbenzene	1.5236	1.4791	97.08	100	-3	*
	m+p-Xylene	0.5947	0.5830	196.07	200	-2	
	Xylene (Total)	0.5908	0.5820	295.52	300	-1	
	o-Xylene	0.5830	0.5798	99.45	100	-1	
	Styrene	1.0265	1.0415	101.46	100	1	
#	Bromoform	0.3416	0.3316	97.07	100	-3	#

Minimum RRF for SPCC(#)=0.10 (0.30 for Chlorobenzene, 1,1,2,2-Tetrachloroethane)
Maximum %Drift for CCC(*)=20%

7A

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP07159 Calibration Date: 03/18/04 Time: 13:08

Lab File ID: nm18c01.d Init. Calib. Date(s): 03/10/04 03/10/04

Matrix: (soil/water) WATER Level: (low/med) LOW GC Column: DB-624 ID: .25

	COMPOUND	RRF	RRF100	ACTUAL CONC.	TRUE CONC.	% DRIFT	
	Isopropylbenzene	1.3563	1.3453	99.19	100	-1	
	Cyclohexanone	0.0210	0.0136	808.50	1250	-35	
#	1,1,2,2-Tetrachloroethane	1.0419	0.8730	83.79	100	-16	#
	trans-1,4-Dichloro-2-Butene	0.3665	0.3095	211.14	250	-16	
	Bromobenzene	0.8142	0.7919	97.27	100	-3	
	1,2,3-Trichloropropane	0.3239	0.2766	85.39	100	-15	
	n-Propylbenzene	2.8393	2.7627	97.30	100	-3	
	2-Chlorotoluene	0.6534	0.6318	96.69	100	-3	
	1,3,5-Trimethylbenzene	2.0299	2.0104	99.04	100	-1	
	4-Chlorotoluene	0.6861	0.6634	96.70	100	-3	
	tert-Butylbenzene	0.4690	0.4656	99.26	100	-1	
	Pentachloroethane	0.5420	0.5346	98.64	100	-1	
	1,2,4-Trimethylbenzene	2.1237	2.1100	99.35	100	-1	
	sec-Butylbenzene	2.2517	2.3876	106.04	100	6	
	p-Isopropyltoluene	2.0373	2.1710	106.56	100	7	
	1,3-Dichlorobenzene	1.3078	1.3120	100.32	100	0	
	1,4-Dichlorobenzene	1.3755	1.3664	99.34	100	-1	
	n-Butylbenzene	1.6682	1.8898	113.28	100	13	
	1,2-Dichlorobenzene	1.2961	1.2819	98.91	100	-1	
	1,2-Dibromo-3-Chloropropane	0.2319	0.1767	76.18	100	-24	
	1,2,4-Trichlorobenzene	0.6524	0.7932	109.55	100	10	
	Hexachlorobutadiene	0.3424	0.4219	123.21	100	23	
	Naphthalene	2.2548	2.0932	80.93	100	-19	
	1,2,3-Trichlorobenzene	0.6205	0.6813	101.67	100	2	
	Dibromofluoromethane	0.2617	0.2570	49.10	50	-2	
	1,2-Dichloroethane-d4	0.0628	0.0589	46.88	50	-6	
	Dibromofluoromethane(mz111)	0.2650	0.2585	48.77	50	-2	
	1,2-Dichloroethane-d4(mz104)	0.0410	0.0383	46.68	50	-7	
	Toluene-d8(mz100)	0.8567	0.8121	47.39	50	-5	
	4-Bromofluorobenzene(mz174)	0.4320	0.4479	51.83	50	4	
	Toluene-d8	1.2899	1.2316	47.74	50	-5	
	4-Bromofluorobenzene	0.4781	0.4723	49.39	50	-1	

Average %Drift 9

Minimum RRF for SPCC(#)=0.10 (0.30 for Chlorobenzene, 1,1,2,2-Tetrachloroethane)
Maximum %Drift for CCC(*)=20%

APPENDIX A

GC/MS SEMIVOLATILES
DATA DELIVERABLES FORMS

5B

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID: hd304.d DFTPP Injection Date: 04/28/04

Instrument ID: HP04629 DFTPP Injection Time: 15:46

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	48.3
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 relative abundance	79.2
70	Less than 2.0% of mass 69	0.45 (0.57)1
127	40.0 - 60.0% of mass 198	47.5
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	6.34
275	10.0 - 30.0% of mass 198	20.5
365	Greater than 1.00% of mass 198	2.79
441	Present, and less than mass 443	13.3
442	Greater than 40.0 % of mass 198	85.7
443	17.0 - 23.0% of mass 442	16.6 (19.4)2

1-Value is % mass 69 2-Value is % mass of 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD080	STD1074	hd305.d	04/28/04	16:09
02	SBLKWE1188	SBLKWE118	hd306.d	04/28/04	17:25
03	118WELCS8	118WELCS	hd307.d	04/28/04	18:37
04	N4029	4260940	hd308.d	04/28/04	19:33
05	N4029MS	4260940	hd309.d	04/28/04	20:29
06	N4029MSD	4260940	hd310.d	04/28/04	21:25
07	PPTCL	4258124	hd311.d	04/28/04	22:22
08	PPTCLMS	4258124	hd312.d	04/28/04	23:18
09	TL--A	4258483	hd313.d	04/29/04	00:14
10	TL--B	4258486	hd314.d	04/29/04	01:10
11	300NV	4258799	hd315.d	04/29/04	02:07
12	300NVMS	4258799	hd316.d	04/29/04	03:03

2C

WATER SEMIVOLATILE SURROGATE RECOVERY

Lab Name: Lancaster Laboratories Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

	EPA SAMPLE NO.	S1 (2FP) #	S2 (PHL) #	S3 (NBZ) #	S4 (FBP) #	S5 (TBP) #	S6 (TPH) #	TOT OUT
01	SBLKWE1188	61	41	83	80	94	83	0
02	118WELCS8	62	41	93	86	98	90	0
03	N4029	56	38	91	83	80	88	0
04	N4029MS	59	41	93	88	78	84	0
05	N4029MSD	58	40	93	93	79	85	0
06	PPTCL	63	40	94	81	100	84	0
07	PPTCLMS	63	42	95	92	103	91	0
08	TL--A	60	39	92	82	88	84	0
09	TL--B	59	40	91	85	89	79	0
10	300NV	60	39	95	83	98	88	0
11	300NVMS	64	42	97	94	102	90	0
12	0947B	61	40	92	82	94	86	0
13	0947A	62	40	92	84	96	91	0
14	6489N	60	40	93	84	96	71	0
15	6489NMS	65	42	95	94	102	84	0
16	6490N	51	32	91	85	73	66	0
17	6491N	28	18	89	81	47	67	0
18	14494	60	39	91	84	98	90	0
19	14794	60	39	90	81	94	86	0

		QC LIMITS
S1 (2FP)	= 2-Fluorophenol	(23-94)
S2 (PHL)	= Phenol-d6	(10-80)
S3 (NBZ)	= Nitrobenzene-d5	(54-124)
S4 (FBP)	= 2-Fluorobiphenyl	(64-112)
S5 (TBP)	= 2,4,6-Tribromophenol	(45-142)
S6 (TPH)	= Terphenyl-d14	(53-124)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogate diluted out

FORM II SV-1

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SBLKWE1188

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Matrix: (soil/water) WATER Lab Sample ID: SBLKWE118

Sample wt/vol: 500 (g/mL) ML Lab File ID: hd306.d

Level: (low/med) LOW Date Received:

% Moisture: not dec: dec: Date Extracted: 04/28/04

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 04/28/04

Injection Volume: 1 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: Extraction: Sepf

CAS NO.	COMPOUND	CONCENTRATION UNITS: (mg/L or mg/Kg)	MDL	MG/L	Q
110-86-1	Pyridine			0.004	U
106-46-7	1,4-Dichlorobenzene			0.002	U
95-48-7	2-Methylphenol			0.002	U
106-44-5	4-Methylphenol			0.004	U
67-72-1	Hexachloroethane			0.002	U
98-95-3	Nitrobenzene			0.002	U
87-68-3	Hexachlorobutadiene			0.002	U
88-06-2	2,4,6-Trichlorophenol			0.002	U
95-95-4	2,4,5-Trichlorophenol			0.002	U
121-14-2	2,4-Dinitrotoluene			0.002	U
118-74-1	Hexachlorobenzene			0.002	U
87-86-5	Pentachlorophenol			0.006	U

4B

SEMIVOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

SBLKWE1188

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID: hd306.d Lab Sample ID: SBLKWE118

Date Extracted: 04/28/04 Extraction: Sepf

Date Analyzed: 04/28/04 Time Analyzed: 17:25

Matrix (soil/water): WATER Level: (low/med) LOW

Instrument ID: HP04629

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	118WELCS8	118WELCS	hd307.d	04/28/04
02	N4029	4260940	hd308.d	04/28/04
03	N4029MS	4260940	hd309.d	04/28/04
04	N4029MSD	4260940	hd310.d	04/28/04
05	PPTCL	4258124	hd311.d	04/28/04
06	PPTCLMS	4258124	hd312.d	04/28/04
07	TL--A	4258483	hd313.d	04/29/04
08	TL--B	4258486	hd314.d	04/29/04
09	300NV	4258799	hd315.d	04/29/04
10	300NVMS	4258799	hd316.d	04/29/04
11	0947B	4259583	hd342.d	04/29/04
12	0947A	4259584	hd343.d	04/29/04
13	6489N	4261122	hd344.d	04/29/04
14	6489NMS	4261122	hd345.d	04/29/04
15	6490N	4261126	hd346.d	04/29/04
16	6491N	4261130	hd347.d	04/30/04
17	14494	4261536	hd348.d	04/30/04
18	14794	4261537	hd349.d	04/30/04

COMMENTS:

WATER GC/MS SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: LANCASTER LABS Lab Code: LANCAS

UNSPIKED:hd308.d	MATRIX SPIKE:hd309.d	SPIKE DUPLICATE:hd310.d
N4029 4260940	N4029MS 4260940	N4029MSD 4260940
AMT USED:330.0 ml	AMT USED: 330.0 ml	AMT USED: 330.0 ml
FINAL VOL:1 ml	FINAL VOL: 1 ml	FINAL VOL: 1 ml

INSTRUMENT: HP04629 DILUTION FACTOR: 1 BATCH: 04118WAE026

%MOISTURE: EXTRACT SPIKE LEVEL: 303.03

COMPOUND NAME	MS SPIKE	MSD SPIKE	US CONC UG/L	MS CONC UG/L	MSD CONC UG/L	MS REC %	MSD REC %	Range LOWER-UPPER	INSPEC	RPD %	RPD MAX	INSPEC
Pyridine	303.03	303.03	ND	180.01	177.70	59	59	31- 88	YES	1	30	YES
1,4-Dichlorobenzene	303.03	303.03	ND	228.40	183.18	75	60	42-105	YES	22	30	YES
2-Methylphenol	303.03	303.03	ND	214.95	212.98	71	70	34-119	YES	1	30	YES
4-Methylphenol	303.03	303.03	ND	204.71	195.66	68	65	30-114	YES	4	30	YES
Hexachloroethane	303.03	303.03	ND	185.83	149.06	61	49	20-116	YES	22	30	YES
Nitrobenzene	303.03	303.03	ND	262.32	251.88	87	83	43-133	YES	4	30	YES
Hexachlorobutadiene	303.03	303.03	ND	172.60	150.11	57	50	31-122	YES	14	30	YES
2,4,6-Trichlorophenol	303.03	303.03	ND	213.71	220.65	71	73	31-140	YES	3	30	YES
2,4,5-Trichlorophenol	303.03	303.03	ND	244.80	246.76	81	81	38-138	YES	1	30	YES
2,4-Dinitrotoluene	303.03	303.03	ND	283.93	282.59	94	93	43-145	YES	0	30	YES
Hexachlorobenzene	303.03	303.03	ND	255.75	237.98	84	79	65-114	YES	7	30	YES
Pentachlorophenol	303.03	303.03	ND	212.29	205.80	70	68	20-130	YES	3	30	YES

COMMENTS: _____

Lancaster Laboratories, Inc.
WATER Semi Volatile Laboratory Control Sample Recovery

LAB NAME: LANCASTER LABS LAB CODE: LANCAS INSTRUMENT: HP04629

Method: SW-846 8270C File ID: hd307.d

LCS SAMPLE NO: 118WELCS BATCH: 04118WAE026 Sample Code: 118WELCSB

COMPOUND NAME	SPIKE LEVEL	LCS CONC UG/L	QCREF REC %	RANGE LOWER-UPPER	INSPEC
Pyridine	200.00	104.34	52	31 - 88	YES
1,4-Dichlorobenzene	200.00	147.44	74	41 - 102	YES
2-Methylphenol	200.00	155.69	78	56 - 105	YES
4-Methylphenol	200.00	145.78	73	52 - 97	YES
Hexachloroethane	200.00	120.75	60	22 - 102	YES
Nitrobenzene	200.00	175.03	88	63 - 112	YES
Hexachlorobutadiene	200.00	114.18	57	20 - 111	YES
2,4,6-Trichlorophenol	200.00	167.09	84	71 - 109	YES
2,4,5-Trichlorophenol	200.00	172.89	86	70 - 115	YES
2,4-Dinitrotoluene	200.00	188.91	94	75 - 122	YES
Hexachlorobenzene	200.00	164.55	82	71 - 110	YES
Pentachlorophenol	200.00	162.48	81	50 - 112	YES

NC = Could not calculate

Comments: _____

8B

SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: LANCASTER LABS Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID (Standard): hd305.d Date Analyzed: 04/28/04

Instrument ID: HP04629 Time Analyzed: 16:09

		IS1(DCB)			IS2(NPT)			IS3(ANT)	
		AREA	#	RT	#	AREA	#	RT	#	AREA	#	RT	#
	12 HOUR STD	203029		12.539		522700		16.278		353701		21.663	
	UPPER LIMIT	406058		13.039		1045400		16.778		707402		22.163	
	LOWER LIMIT	101515		12.039		261350		15.778		176851		21.163	
	EPA SAMPLE NO.												
01	SBLKWE1188	194574		12.547		543438		16.274		350337		21.660	
02	118WELCS8	195250		12.543		512504		16.281		353813		21.674	
03	N4029	189477		12.535		513760		16.273		334510		21.657	
04	N4029MS	191737		12.541		525135		16.279		358865		21.672	
05	N4029MSD	189072		12.540		498669		16.278		326501		21.668	
06	PPTCL	185421		12.533		489427		16.277		325023		21.663	
07	PPTCLMS	175557		12.537		463579		16.278		309382		21.667	
08	TL--A	191142		12.535		516854		16.272		331214		21.657	
09	TL--B	186588		12.535		490027		16.272		307678		21.653	
10	300NV	195196		12.537		499364		16.275		342797		21.660	
11	300NVMS	177162		12.542		471052		16.280		316826		21.663	

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d10

AREA UPPER LIMIT (advisory) = +100% of internal standard area
AREA LOWER LIMIT (advisory) = -50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag internal standard are and RT values with an asterisk
* Values outside of QC limits.

8C

SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: LANCASTER LABS Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID (Standard): hd305.d Date Analyzed: 04/28/04

Instrument ID: HP04629 Time Analyzed: 16:09

		IS4(PHN) AREA	#	RT	#	IS5(CRY) AREA	#	RT	#	IS6(PRY) AREA	#	RT	#
	12 HOUR STD	519324		26.246		434978		33.163		544829		38.940	
	UPPER LIMIT	1038648		26.746		869956		33.663		1089658		39.440	
	LOWER LIMIT	259662		25.746		217489		32.663		272415		38.440	
	EPA SAMPLE NO.												
01	SBLKWE1188	514480		26.238		396735		33.142		497007		38.921	
02	118WELCS8	528120		26.239		418781		33.161		520238		38.946	
03	N4029	503806		26.233		390045		33.136		475982		38.924	
04	N4029MS	519256		26.237		438071		33.159		522949		38.941	
05	N4029MSD	487647		26.232		396704		33.152		509924		38.936	
06	PPTCL	479781		26.232		401649		33.131		525309		38.908	
07	PPTCLMS	454183		26.241		364215		33.153		448413		38.938	
08	TL--A	477923		26.233		380364		33.137		488408		38.917	
09	TL--B	434133		26.225		408626		33.129		478344		38.908	
10	300NV	506095		26.226		390868		33.130		509808		38.919	
11	300NVMS	466353		26.237				33.149		498608		38.932	

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

AREA UPPER LIMIT (advisory) = +100% of internal standard area
AREA LOWER LIMIT (advisory) = -50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag internal standard are and RT values with an asterisk
* Values outside of QC limits.

6B

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP04629 Calibration Date(s): 04/27/04 04/27/04

Calibration Times: 08:21 13:10

Min $\overline{RRF}$ for SPCC(#) = 0.050 Max %RSD for CCC(*) = 30%

LAB FILE ID: RRF5 = hd284.d RRF15 = hd285.d RRF30 = hd286.d
RRF50 = hd281.d RRF80 = hd283.d RRF120 = hd282.d

COMPOUND		RRF5	RRF15	RRF30	RRF50	RRF80	RRF120	RRF	$\overline{RRF}$	% RSD	CAL. METHOD	
1,4-Dioxane		0.432	0.474	0.492	0.418	0.446	0.422		0.447	7	AVG	
N-Nitrosodimethylamine		0.858	0.904	0.906	0.835	0.893	0.830		0.871	4	AVG	
Pyridine		1.327	1.357	1.347	1.230	1.320	1.036		1.269	10	AVG	
2-Picoline		1.248	1.262	1.262	1.190	1.169	0.971		1.184	9	AVG	
Aniline		1.654	1.815	1.680	1.729	1.589	1.559		1.671	6	AVG	
Phenol	*	1.492	1.498	1.410	1.449	1.461	1.419		1.455	2	AVG	*
bis(2-Chloroethyl)ether		1.176	1.190	1.093	1.143	1.215	1.126		1.157	4	AVG	
2-Chlorophenol		1.051	1.078	1.032	1.060	1.085	1.034		1.057	2	AVG	
1,3-Dichlorobenzene		1.507	1.491	1.485	1.483	1.475	1.456		1.483	1	AVG	
1,4-Dichlorobenzene	*	1.503	1.578	1.507	1.546	1.543	1.491		1.528	2	AVG	*
Benzyl alcohol		0.672	0.605	0.635	0.694	0.695	0.653		0.659	5	AVG	
1,2-Dichlorobenzene		1.476	1.435	1.402	1.435	1.447	1.373		1.428	3	AVG	
2-Methylphenol		0.987	1.016	0.964	1.011	0.986	0.985		0.992	2	AVG	
2,2'-oxybis(1-Chloropropane)		1.510	1.453	1.383	1.450	1.425	1.380		1.434	3	AVG	
bis(2-Chloroisopropyl)ether		1.510	1.453	1.383	1.450	1.425	1.380		1.434	3	AVG	
Acetophenone		1.557	1.513	1.432	1.519	1.520	1.509		1.508	3	AVG	
N-Nitroso-di-n-propylamine	#	0.988	1.008	0.918	0.974	0.978	0.950		0.969	3	AVG	#
4-Methylphenol		0.999	0.994	0.952	1.052	1.009	0.997		1.001	3	AVG	
o-Toluidine		1.546	1.554	1.469	1.595	1.451	1.435		1.508	4	AVG	
Hexachloroethane		0.611	0.616	0.618	0.632	0.624	0.603		0.617	2	AVG	
Nitrobenzene		0.486	0.516	0.508	0.520	0.528	0.513		0.512	3	AVG	
Isophorone		0.835	0.878	0.867	0.868	0.859	0.866		0.862	2	AVG	
2-Nitrophenol	*	0.243	0.257	0.263	0.258	0.268	0.266		0.259	3	AVG	*
2,4-Dimethylphenol		0.421	0.431	0.416	0.427	0.422	0.433		0.425	2	AVG	
bis(2-Chloroethoxy)methane		0.436	0.454	0.450	0.431	0.440	0.435		0.441	2	AVG	
Benzoic acid		0.207	0.224	0.226	0.257	0.283	0.326		0.254	18	1STDEG	
2,4-Dichlorophenol	*	0.421	0.449	0.431	0.451	0.440	0.446		0.440	3	AVG	*
1,2,4-Trichlorobenzene		0.492	0.504	0.486	0.500	0.490	0.489		0.493	1	AVG	
Naphthalene		0.970	0.983	0.935	0.941	0.950	0.948		0.955	2	AVG	
4-Chloroaniline		0.387	0.439	0.416	0.426	0.408	0.395		0.412	5	AVG	
Hexachlorobutadiene	*	0.149	0.169	0.160	0.162	0.164	0.159		0.161	4	AVG	*
Caprolactam		0.120	0.136	0.126	0.129	0.124	0.131		0.128	4	AVG	
4-Chloro-3-methylphenol	*	0.322	0.336	0.326	0.339	0.332	0.346		0.334	3	AVG	*
2-Methylnaphthalene		0.728	0.761	0.716	0.739	0.757	0.763		0.744	3	AVG	
1-Methylnaphthalene		0.681	0.716	0.697	0.706	0.704	0.714		0.703	2	AVG	
Hexachlorocyclopentadiene	#	0.075	0.124	0.134	0.162	0.172	0.164		0.139	26	1STDEG	#
2,4,6-Trichlorophenol	*	0.357	0.390	0.387	0.399	0.390	0.385		0.385	4	AVG	*
2,4,5-Trichlorophenol		0.395	0.401	0.403	0.425	0.404	0.424		0.408	3	AVG	
Biphenyl		1.503	1.475	1.483	1.420	1.490	1.439		1.468	2	AVG	
Diphenyl		1.503	1.475	1.483	1.420	1.490	1.439		1.468	2	AVG	
1,1'-Biphenyl		1.503	1.475	1.483	1.420	1.490	1.439		1.468	2	AVG	
2-Chloronaphthalene		1.256	1.265	1.247	1.239	1.243	1.220		1.245	1	AVG	
Diphenyl ether		0.820	0.849	0.835	0.830	0.823	0.800		0.826	2	AVG	
2-Nitroaniline		0.381	0.400	0.385	0.401	0.401	0.401		0.395	2	AVG	
Dimethylphthalate		1.475	1.493	1.461	1.481	1.447	1.456		1.469	1	AVG	
2,6-Dinitrotoluene		0.371	0.387	0.395	0.395	0.391	0.396		0.389	2	AVG	
Acenaphthylene		1.608	1.634	1.641	1.616	1.622	1.600		1.620	1	AVG	
3-Nitroaniline		0.306	0.325	0.329	0.337	0.330	0.340		0.328	4	AVG	
Acenaphthene	*	1.061	1.049	1.030	1.037	1.044	1.032		1.042	1	AVG	*
2,4-Dinitrophenol	#	0.150	0.178	0.197	0.234	0.241	0.279		0.213	22	1STDEG	#
4-Nitrophenol	#	0.188	0.223	0.224	0.249	0.251	0.271		0.234	12	AVG	#
Dibenzofuran		1.766	1.782	1.744	1.784	1.713	1.751		1.757	2	AVG	

1 images 4/27/04

6C

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP04629 Calibration Date(s): 04/27/04 04/27/04

Calibration Times: 08:21 13:10

Min $\overline{RRF}$ for SPCC(#) = 0.050 Max %RSD for CCC(*) = 30%

LAB FILE ID: RRF5 = hd284.d RRF15 = hd285.d RRF30 = hd286.d
RRF50 = hd281.d RRF80 = hd283.d RRF120 = hd282.d

		COMPOUND	RRF5	RRF15	RRF30	RRF50	RRF80	RRF120	RRF	$\overline{RRF}$	% RSD	CAL. METHOD
		2,4-Dinitrotoluene	0.441	0.466	0.473	0.497	0.485	0.505		0.478	5	AVG
		1-Naphthylamine	0.816	0.856	0.870	0.921	0.866	0.832		0.860	4	AVG
		2,3,4,6-Tetrachlorophenol	0.193	0.225	0.229	0.240	0.236	0.242		0.228	8	AVG
		2-Naphthylamine	0.867	0.971	1.006	1.032	0.981	0.964		0.970	6	AVG
		Diethylphthalate	1.350	1.402	1.344	1.374	1.367	1.366		1.367	1	AVG
		Fluorene	1.294	1.317	1.310	1.343	1.301	1.321		1.315	1	AVG
		4-Chlorophenyl-phenylether	0.471	0.501	0.486	0.475	0.467	0.471		0.478	3	AVG
		4-Nitroaniline	0.340	0.358	0.352	0.360	0.350	0.369		0.355	3	AVG
		4,6-Dinitro-2-methylphenol	0.139	0.158	0.166	0.185	0.185	0.201		0.172	13	AVG
	*	N-Nitrosodiphenylamine (1)	0.656	0.670	0.633	0.649	0.663	0.641		0.652	2	AVG
		1,2-Diphenylhydrazine	0.995	0.975	0.953	0.944	0.947	0.918		0.955	3	AVG
		4-Bromophenyl-phenylether	0.210	0.198	0.192	0.196	0.196	0.189		0.197	4	AVG
		Hexachlorobenzene	0.317	0.312	0.307	0.305	0.304	0.303		0.308	2	AVG
	*	Pentachlorophenol	0.127	0.144	0.152	0.169	0.173	0.185		0.159	13	AVG
		Phenanthrene	1.288	1.247	1.220	1.220	1.191	1.189		1.226	3	AVG
		Anthracene	1.260	1.296	1.252	1.246	1.245	1.234		1.256	2	AVG
		Carbazole	1.177	1.242	1.204	1.246	1.237	1.223		1.222	2	AVG
		Di-n-butylphthalate	1.596	1.691	1.602	1.663	1.610	1.620		1.630	2	AVG
	*	Fluoranthene	1.107	1.146	1.113	1.146	1.130	1.095		1.123	2	AVG
		Benzidine	0.780	1.011	1.068	1.089	1.017	1.022		0.998	11	AVG
		Pyrene	1.537	1.533	1.430	1.456	1.456	1.481		1.483	3	AVG
		Butylbenzylphthalate	1.047	1.060	1.041	1.104	1.066	1.103		1.070	3	AVG
		3,3'-Dichlorobenzidine	0.524	0.602	0.588	0.573	0.553	0.506		0.558	7	AVG
		4,4'-Methylenebis(2-Chloroanil	0.190	0.213	0.219	0.219	0.202	0.188		0.205	7	AVG
		Benzo(a)anthracene	1.122	1.143	1.076	1.096	1.082	1.089		1.101	2	AVG
		Chrysene	1.088	1.093	1.061	1.032	1.016	0.998		1.048	4	AVG
		bis(2-Ethylhexyl)phthalate	1.552	1.520	1.455	1.558	1.487	1.540		1.519	3	AVG
	*	Di-n-octylphthalate	2.059	2.022	1.885	2.169	2.045	2.221		2.067	6	AVG
		7,12-Dimethylbenz[a]anthracene	0.477	0.519	0.511	0.544	0.526	0.554		0.522	5	AVG
		Benzo(b)fluoranthene	1.128	1.121	1.118	1.174	1.152	1.246		1.156	4	AVG
		Benzo(k)fluoranthene	1.112	1.119	1.080	1.112	1.026	1.007		1.076	4	AVG
	*	Benzo(a)pyrene	1.025	1.061	1.074	1.048	1.053	1.040		1.050	2	AVG
		Indeno(1,2,3-cd)pyrene	1.404	1.443	1.407	1.201	1.215	1.292		1.327	8	AVG
		Dibenz(a,h)anthracene	1.267	1.313	1.305	1.159	1.147	1.208		1.233	6	AVG
		Benzo(g,h,i)perylene	1.464	1.495	1.428	1.233	1.206	1.295		1.354	9	AVG
		2-Fluorophenol	1.230	1.190	1.204	1.184	1.189	1.160		1.193	2	AVG
		Phenol-d5	1.408	1.435	1.334	1.463	1.426	1.406		1.412	3	AVG
		Phenol-d6	1.408	1.435	1.334	1.463	1.426	1.406		1.412	3	AVG
		Nitrobenzene-d5	0.477	0.503	0.504	0.508	0.508	0.502		0.500	2	AVG
		2-Fluorobiphenyl	1.406	1.405	1.386	1.378	1.412	1.352		1.390	2	AVG
		2,4,6-Tribromophenol	0.272	0.286	0.293	0.304	0.299	0.313		0.295	5	AVG
		Terphenyl-d14	0.838	0.895	0.843	0.874	0.830	0.846		0.854	3	AVG
									Average %RSD		4	

(1) Cannot be separated from Diphenylamine
4,6-Dinitro-2-methylphenol and 4-Nitrophenol are at 10 ng/ul in the 5 standard.
Benzoic acid, Pentachlorophenol and 2,4-Dinitrophenol are at 15 ng/ul in the 5 standard.
Benzidine Levels in the 5,15,30,50,80,120 standards are 15,45,90,150,240,360 ng/ul, respectively.
Benzoic acid, Pentachlorophenol and 2,4-Dinitrophenol are at 15 ng/ul, 30 ng/ul,40 ng/ul in the 5 ,15, 30 standards.

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP04629 Calibration Date: 04/29/04 Time: 18:59

Lab File ID: hd341.d Init. Calib. Date(s): 04/29/04 04/29/04

Init. Calib. Times(s): 11:20 15:55

Min RRF for SPCC(#) = 0.050 Max %Drift for CCC(*) = 20%

	COMPOUND	RRF	RRF50	ACTUAL CONC.	TRUE CONC.	% DRIFT
	1,4-Dioxane	0.375	0.427	56.890	50.0	14
	N-Nitrosodimethylamine	0.876	0.902	51.530	50.0	3
	Pyridine	1.316	1.323	50.230	50.0	0
	2-Picoline	1.162	1.254	53.980	50.0	8
	Aniline	1.622	1.696	52.270	50.0	5
*	Phenol	1.396	1.393	49.900	50.0	0*
	bis(2-Chloroethyl)ether	1.127	1.104	48.970	50.0	-2
	2-Chlorophenol	1.017	1.043	51.260	50.0	3
	1,3-Dichlorobenzene	1.467	1.497	51.030	50.0	2
*	1,4-Dichlorobenzene	1.484	1.508	50.820	50.0	2*
	Benzyl alcohol	0.648	0.674	51.980	50.0	4
	1,2-Dichlorobenzene	1.409	1.384	49.090	50.0	-2
	2-Methylphenol	0.982	0.967	49.250	50.0	-2
	2,2'-oxybis(1-Chloropropane)	1.407	1.364	48.460	50.0	-3
	bis(2-Chloroisopropyl)ether	1.407	1.364	48.460	50.0	-3
	Acetophenone	1.497	1.516	50.630	50.0	1
#	N-Nitroso-di-n-propylamine	0.957	0.944	49.290	50.0	-1#
	4-Methylphenol	0.975	0.980	50.280	50.0	1
	o-Toluidine	1.504	1.527	50.770	50.0	2
	Hexachloroethane	0.619	0.635	51.280	50.0	3
	Nitrobenzene	0.518	0.537	51.860	50.0	4
	Isophorone	0.871	0.885	50.800	50.0	2
*	2-Nitrophenol	0.233	0.249	53.420	50.0	7*
	2,4-Dimethylphenol	0.413	0.433	52.430	50.0	5
	bis(2-Chloroethoxy)methane	0.439	0.452	51.460	50.0	3
	Benzoic acid	0.163	0.158	48.330	50.0	-3
*	2,4-Dichlorophenol	0.427	0.442	51.800	50.0	4*
	1,2,4-Trichlorobenzene	0.479	0.488	50.980	50.0	2
	Naphthalene	0.932	0.964	51.740	50.0	3
	4-Chloroaniline	0.420	0.434	51.740	50.0	3
*	Hexachlorobutadiene	0.161	0.174	54.100	50.0	8*
	Caprolactam	0.125	0.126	50.610	50.0	1
*	4-Chloro-3-methylphenol	0.319	0.334	52.280	50.0	5*
	2-Methylnaphthalene	0.725	0.746	51.450	50.0	3
	1-Methylnaphthalene	0.689	0.710	51.520	50.0	3
#	Hexachlorocyclopentadiene	0.143	0.181	50.740	50.0	1#

MM 1950

07829 07

7C

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP04629 Calibration Date: 04/29/04 Time: 18:59

Lab File ID: hd341.d Init. Calib. Date(s): 04/29/04 04/29/04

Init. Calib. Times(s): 11:20 15:55

Min RRF for SPCC(#) = 0.050 Max %Drift for CCC(*) = 20%

COMPOUND	RRF	RRF50	ACTUAL CONC.	TRUE CONC.	% DRIFT
* 2,4,6-Trichlorophenol	0.358	0.366	51.070	50.0	2*
2,4,5-Trichlorophenol	0.391	0.392	50.110	50.0	0
Biphenyl	1.436	1.486	51.750	50.0	4
Diphenyl	1.436	1.486	51.750	50.0	4
1,1'-Biphenyl	1.436	1.486	51.750	50.0	4
2-Chloronaphthalene	1.228	1.259	51.250	50.0	3
Diphenyl ether	0.805	0.815	50.570	50.0	1
2-Nitroaniline	0.387	0.389	50.210	50.0	0
Dimethylphthalate	1.448	1.493	51.570	50.0	3
2,6-Dinitrotoluene	0.383	0.399	52.070	50.0	4
Acenaphthylene	1.734	1.797	51.840	50.0	4
3-Nitroaniline	0.328	0.336	51.130	50.0	2
* Acenaphthene	1.038	1.065	51.290	50.0	3*
# 2,4-Dinitrophenol	0.174	0.176	46.880	50.0	-6#
# 4-Nitrophenol	0.237	0.237	49.950	50.0	0#
Dibenzofuran	1.707	1.714	50.220	50.0	0
2,4-Dinitrotoluene	0.467	0.481	51.450	50.0	3
1-Naphthylamine	0.996	0.982	49.330	50.0	-1
2,3,4,6-Tetrachlorophenol	0.198	0.203	51.200	50.0	2
2-Naphthylamine	1.016	1.049	51.650	50.0	3
Diethylphthalate	1.371	1.358	49.530	50.0	-1
Fluorene	1.306	1.328	50.850	50.0	2
4-Chlorophenyl-phenylether	0.465	0.470	50.540	50.0	1
4-Nitroaniline	0.356	0.366	51.400	50.0	3
4,6-Dinitro-2-methylphenol	0.160	0.168	52.460	50.0	5
* N-Nitrosodiphenylamine (1)	0.610	0.633	51.820	50.0	4*
1,2-Diphenylhydrazine	0.934	0.955	51.110	50.0	2
4-Bromophenyl-phenylether	0.188	0.195	51.930	50.0	4
Hexachlorobenzene	0.303	0.316	52.110	50.0	4
* Pentachlorophenol	0.135	0.126	44.840	50.0	-10*
Phenanthrene	1.216	1.235	50.780	50.0	2
Anthracene	1.246	1.261	50.600	50.0	1
Carbazole	1.201	1.233	51.320	50.0	3
Di-n-butylphthalate	1.586	1.642	51.760	50.0	4
* Fluoranthene	1.109	1.144	51.620	50.0	3*
Benzidine	0.943	1.017	161.710	150.0	8

(1) Cannot be Separated from Diphenylamine

7C cont

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP04629 Calibration Date: 04/29/04 Time: 18:59

Lab File ID: hd341.d Init. Calib. Date(s): 04/29/04 04/29/04

Init. Calib. Times(s): 11:20 15:55

Min RRF for SPCC(#) = 0.050 Max %Drift for CCC(*) = 20%

COMPOUND	RRF	RRF50	ACTUAL CONC.	TRUE CONC.	% DRIFT
Pyrene	1.404	1.362	48.510	50.0	-3
Butylbenzylphthalate	0.986	0.981	49.770	50.0	0
3,3'-Dichlorobenzidine	0.566	0.586	51.830	50.0	4
4,4'-Methylenebis(2-Chloroanil	0.206	0.216	52.640	50.0	5
Benzo(a)anthracene	1.074	1.076	50.090	50.0	0
Chrysene	1.038	1.068	51.450	50.0	3
bis(2-Ethylhexyl)phthalate	1.329	1.339	50.390	50.0	1
* Di-n-octylphthalate	1.857	1.810	48.750	50.0	-2*
7,12-Dimethylbenz[a]anthracene	0.548	0.535	48.870	50.0	-2
Benzo(b)fluoranthene	1.220	1.213	49.720	50.0	-1
Benzo(k)fluoranthene	1.169	1.146	49.010	50.0	-2
* Benzo(a)pyrene	1.162	1.179	50.730	50.0	1*
Indeno(1,2,3-cd)pyrene	1.401	1.503	53.640	50.0	7
Dibenz(a,h)anthracene	1.301	1.358	52.220	50.0	4
Benzo(g,h,i)perylene	1.402	1.469	52.390	50.0	5
2-Fluorophenol	1.176	1.200	51.000	50.0	2
Phenol-d5	1.396	1.391	49.820	50.0	0
Phenol-d6	1.396	1.391	49.820	50.0	0
Nitrobenzene-d5	0.499	0.531	53.240	50.0	6
2-Fluorobiphenyl	1.380	1.403	50.830	50.0	2
2,4,6-Tribromophenol	0.290	0.289	49.890	50.0	0
Terphenyl-d14	0.802	0.788	49.100	50.0	-2
			Average %Drift:		3

APPENDIX A

GC VOLATILES
DATA DELIVERABLES FORMS

Quality Control Summary
SDG# ACO97

Surrogate Recovery
Volatiles by GC - Water

LL Sample#	Sample Code	Dilution Factor	1B4CB-H Water-HALL % Recovery	1B4CB-P Water-PID % Recovery	TOT OUT
3533488	07549	1.0	94	100	
3533489	07548	1.0	91	100	
3533490	07552	20.0		97	
3533491	07553	100.0		100	
3533492	07554	200.0		105	
3533493	07555	50.0		103	
3533494	07556	100.0		102	
3533495	07557	50.0		102	
3533496	07558	10.0		102	
3533497	07559	200.0		103	
3533498	07560	10.0		100	
3533499	07578	1.0	90	102	
3534617	07561	1.0	98	101	
3534618	07562	1.0		100	
3534619	07563	1.0	93	101	
3534620MS	07563	1.0	116	106	
3534621MSD	07563	1.0	111	103	
3534622	07564	1.0		102	
3534623	07579	1.0	95	102	
3534624	07565	1.0		100	
3534625	07566	1.0		103	
BLK2023	METHOD BLANK	1.0	93	101	
BLK2024	METHOD BLANK	1.0	96	102	
BLK2025	METHOD BLANK	1.0		102	
BLK2031	METHOD BLANK	1.0		99	
BLK2032	METHOD BLANK	1.0		100	
LCS2036	LAB CONTROL	1.0	106	106	
LCS2039	LAB CONTROL	1.0		102	

* = Values outside quality control limits.
D = Surrogates diluted - not counted towards total out.
TOT OUT = Total # of surrogates with recovery outside control limits.

		Control Limits Lower	Upper
1B4CB-H	= 1-Bromo-4-Chlorobenzene (Water - HALL)	65	134
1B4CB-P	= 1-Bromo-4-Chlorobenzene (Water - PID)	79	126

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Quality Control Summary
SDG# RCS37

Method Blank
Volatiles by GC - Water

Blank ID.....: BLK5501
Date.....: 04/08/04
Instrument.....: 5890-55

Batch Number.....: 04099A55A
Time.....: 14:06
Matrix.....: Water

Sample Information

LL Sample#	Sample Code	Analysis Date	Analysis Time
LCS5501	LAB CONTROL	04/08/04	15:18
LDS5501	LAB CON DUP	04/08/04	15:54
4246375	M21--	04/08/04	16:30
4249551	EOM02	04/08/04	17:06
4249555	EOM03	04/08/04	17:42
4249552	EOM01	04/08/04	18:18
4249553	EOM05	04/08/04	18:54
4249554	EOM04	04/08/04	19:30
4246375MS	M21--	04/08/04	21:17
4249552	EOM01	04/08/04	23:16

Method Blank Results

CAS Number	Compound	Blank Conc. (UG/L)	LOQ (UG/L)	MDL (UG/L)
1330-20-7	TOTAL XYLENES	ND	3	.6
75-65-0	TERT-BUTYL ALCOHOL	ND	100	20
1634-04-4	METHYL T-BUTYL ETHER	ND	1	.3
71-43-2	BENZENE	ND	1	.2
108-88-3	TOLUENE	ND	1	.2
100-41-4	ETHYLBENZENE	ND	1	.2

LOQ = Limit of Quantitation; MDL = Method Detection Limit
ND = None Detected; * = Above Limit of Quantitation

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Quality Control Summary
SDG# RCS37

Matrix Spike
Volatiles by GC - Water

Unspiked Sample Number....: 4246375
Spiked Sample Number.....: 4246375MS

Batch Number.....: 04099A55A
Date.....: 04/08/04
Matrix.....: Water

Instrument.....: 5890-55

This MS applies to the following samples:
4249551 4249552 4249553 4249554 4249555

Compound	Spike Added (UG/L)	Sample Conc (UG/L)	MS Conc (UG/L)	MS % Recov	QC Limits Recov
TOTAL XYLENES	60.0	0.00	63.3	105	78-130
TERT-BUTYL ALCOHOL	500	0.00	532	106	64-128
METHYL T-BUTYL ETHER	20.0	0.00	19.5	97	59-148
BENZENE	20.0	0.00	21.7	109	67-136
TOLUENE	20.0	0.00	21.3	107	78-129
ETHYLBENZENE	20.0	0.00	21.1	105	75-133

MS=Matrix Spike; ND=None Detected

* = Recovery outside quality control limits.

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Quality Control Summary
SDG# RCS37

Lab Control/Lab Control Duplicate
Volatiles by GC - Water

Batch Number.....: 04099A55A
Date.....: 04/08/04
Matrix.....: Water

This LCS/LDS applies to the following samples:
4249551 4249552 4249553 4249554 4249555

Instrument.....: 5890-55
Calibration Date.....: 04/07/04 - 04/08/04(PID)
Calibration Date.....: 04/07/04 - 04/08/04(FID)

Compound	Spike Added (UG/L)	LCS Conc (UG/L)	LDS Conc (UG/L)	LCS % Recov	LDS % Recov	LCS Limits Recov	RPD	LCS Limits RPD
TOTAL XYLENES	60.0	60.5	60.6	101	101	82-120	0	30
TERT-BUTYL ALCOHOL	500	468	516	94	103	70-128	10	30
METHYL T-BUTYL ETHER	20.0	21.1	21.2	106	106	75-125	0	30
BENZENE	20.0	20.7	21.0	103	105	79-123	2	30
TOLUENE	20.0	20.3	20.8	101	104	82-119	2	30
ETHYLBENZENE	20.0	19.9	20.0	99	100	81-119	1	30

LCS=Lab Control Sample; LDS=Lab Control Sample Duplicate; RPD=Relative Percent Difference

* = Value outside quality control limits.

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Quality Control Summary
SDG# RCS37
Instrument ID: 5890-55
Initial Calibration Summary

Calibration Batch: 04098A55A
Initial Calibration Date(s): 04/07/04-04/08/04(PID)
Initial Calibration Date(s): 04/07/04-04/08/04(FID)

Sample Information

LL Sample#	Sample Code	Analysis Date	Analysis Time
CHKSTD		04/08/04	12:53
BLK5501	METHOD BLANK	04/08/04	14:06
LCS5501	LAB CONTROL	04/08/04	15:18
LDS5501	LAB CON DUP	04/08/04	15:54
4246375	M21--	04/08/04	16:30
4249551	EOM02	04/08/04	17:06
4249555	EOM03	04/08/04	17:42
4249552	EOM01	04/08/04	18:18
4249553	EOM05	04/08/04	18:54
4249554	EOM04	04/08/04	19:30
4246375MS	M21--	04/08/04	21:17
CHKSTD		04/08/04	21:53
4249552	EOM01	04/08/04	23:16
CHKSTD		04/09/04	00:28

STANDARD		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8		
DATE INJECTED		04/07/04	04/07/04	04/07/04	04/07/04	04/07/04	04/07/04	04/08/04	04/08/04		
TIME INJECTED		20:28	21:04	21:40	22:16	22:52	23:28	00:04	01:17		
		Retention Time		Relative Response Factor (RRF)							
COMPOUND (DETECTOR)		LEVEL 3	Window	LEVEL1	LEVEL2	LEVEL3	LEVEL4	LEVEL5	LEVEL6	LEVEL7	LEVEL8	MEAN	% RSD
TERT-BUTYL ALCOHOL	(FID)	3.630	0.03			221.209	246.338	209.082	273.417	245.143	258.175	242.227	10
METHYL T-BUTYL ETHER	(PID)	4.130	0.03		0.4278	0.4073	0.3639	0.3734	0.3949	0.3613	0.3603	0.3841	7
BENZENE	(PID)	5.390	0.03	1.6742	1.8855	1.7343	1.6844	1.7083	1.7491	1.7009	1.7007	1.7297	4
SURR-TFT-P	(PID)	5.940	0.03	0.5691	0.5728	0.5698	0.5575	0.5614	0.5689	0.5464	0.5424	0.5610	2
SURR-TFT-F	(FID)	5.940	0.03	9995.60	9953.46	9941.49	10136.9	9943.50	9847.74	10322.9	9930.71	10009.0	2
TOLUENE	(PID)	6.850	0.03		1.6412	1.5428	1.5091	1.5158	1.5484	1.5246	1.5334	1.5451	3
ETHYLBENZENE	(PID)	8.280	0.03		1.2632	1.1779	1.1793	1.1748	1.2082	1.2213	1.2327	1.2082	3

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Quality Control Summary
SDG# RCS37
Instrument ID: 5890-55
Initial Calibration Summary

Calibration Batch: 04098A55A
Initial Calibration Date(s): 04/07/04-04/08/04(PID)
Initial Calibration Date(s): 04/07/04-04/08/04(FID)

STANDARD		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8		
DATE INJECTED		04/07/04	04/07/04	04/07/04	04/07/04	04/07/04	04/07/04	04/08/04	04/08/04		
TIME INJECTED		20:28	21:04	21:40	22:16	22:52	23:28	00:04	01:17		
COMPOUND (DETECTOR)		Retention Time LEVEL 3	Retention Time Window	Relative Response Factor (RRF) LEVEL1	LEVEL2	LEVEL3	LEVEL4	LEVEL5	LEVEL6	LEVEL7	LEVEL8	MEAN	% RSD
M,P-XYLENE	(PID)	8.480	0.03		1.4543	1.3507	1.3667	1.3598	1.3830	1.3689	1.3712	1.3792	3
O-XYLENE	(PID)	8.910	0.03		1.1301	1.0500	1.0639	1.0504	1.0754	1.0865	1.0970	1.0790	3

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Quality Control Summary
SDG# RCS37

Surrogate Retention Time Summary
Volatiles by GC -Water

Initial Calibration Date(s): 04/07/04 - 04/08/04(PID)
Initial Calibration Date(s): 04/07/04 - 04/08/04(FID)
Instrument.....: 5890-55

SURROGATE RT FROM INITIAL CALIBRATION (Level 3)

Trifluorotoluene (FID)	5.940
Trifluorotoluene (PID)	5.940

Sample Information				RT Summary	
LL Sample#	Sample Code	Analysis Date	Analysis Time	R.T. TFT-F	R.T. TFT-P
BLK5501	METHOD BLANK	04/08/04	14:06	5.950	5.950
LCS5501	LAB CONTROL	04/08/04	15:18	5.950	5.950
LDS5501	LAB CON DUP	04/08/04	15:54	5.940	5.940
4246375	M21--	04/08/04	16:30	5.950	5.950
4249551	EOM02	04/08/04	17:06	5.950	5.950
4249555	EOM03	04/08/04	17:42	5.950	5.950
4249552	EOM01	04/08/04	18:18		5.940
4249553	EOM05	04/08/04	18:54	5.950	5.950
4249554	EOM04	04/08/04	19:30	5.950	5.950
4246375MS	M21--	04/08/04	21:17	5.930	5.930
4249552	EOM01	04/08/04	23:16	5.940	5.940

TFT-F = Trifluorotoluene (FID)
TFT-P = Trifluorotoluene (PID)

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Quality Control Summary
SDG# RCS37

Check Std. Retention Time Summary
Volatiles by GC - Water

Instrument.....: 5890-55
Initial Calibration Date(s): 04/07/04 - 04/08/04(PID)
Initial Calibration Date(s): 04/07/04 - 04/08/04(FID)
Analysis Date.....: 04/08/04
Analysis Time.....: 12:53

Sample Information

LL Sample#	Sample Code	Analysis Date	Analysis Time
BLK5501	METHOD BLANK	04/08/04	14:06
LCS5501	LAB CONTROL	04/08/04	15:18
LDS5501	LAB CON DUP	04/08/04	15:54
4246375	M21--	04/08/04	16:30
4249551	EOM02	04/08/04	17:06
4249555	EOM03	04/08/04	17:42
4249552	EOM01	04/08/04	18:18
4249553	EOM05	04/08/04	18:54
4249554	EOM04	04/08/04	19:30
4246375MS	M21--	04/08/04	21:17

Check Standard Retention Time Summary

Compound	Retention Time	ID Window
TERT-BUTYL ALCOHOL	3.610	+/-0.03
METHYL T-BUTYL ETHER	4.130	+/-0.03
BENZENE	5.380	+/-0.03
TOLUENE	6.840	+/-0.03
ETHYLBENZENE	8.270	+/-0.03
TOTAL XYLENES	17.380	+/-0.03

Retention Time and ID Window units are minutes.

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Quality Control Summary
SDG# RCS37
Instrument ID: 5890-55
Beginning Calibration Verification Summary

CCV Batch: 04099A55A
Data File: C:\DEPT25\55099(1).0002.RAW
Date Injected: 04/08/04 Time Injected: 12:53
Initial Calibration Date(s): 04/07/04-04/08/04(PID)
Initial Calibration Date(s): 04/07/04-04/08/04(FID)

Sample Information

LL Sample#	Sample Code	Analysis Date	Analysis Time
BLK5501	METHOD BLANK	04/08/04	14:06
LCS5501	LAB CONTROL	04/08/04	15:18
LDS5501	LAB CON DUP	04/08/04	15:54
4246375	M21--	04/08/04	16:30
4249551	EOM02	04/08/04	17:06
4249555	EOM03	04/08/04	17:42
4249552	EOM01	04/08/04	18:18
4249553	EOM05	04/08/04	18:54
4249554	EOM04	04/08/04	19:30
4246375MS	M21--	04/08/04	21:17

COMPOUND (DETECTOR)		THEORETICAL CONCENTRATION (UG/L)	ACTUAL CONCENTRATION (UG/L)	% DRIFT	%DRIFT LIMITS
TERT-BUTYL ALCOHOL	(FID)	200.0	205.3	3	-25 to +25
METHYL T-BUTYL ETHER	(PID)	20.0	21.2	6	-15 to +15
BENZENE	(PID)	20.0	20.5	3	-15 to +15
SURR-TFT-P	(PID)	30.0	30.2	1	-43 to +46
SURR-TFT-F	(FID)	30.0	29.9	0	-34 to +36
TOLUENE	(PID)	20.0	20.1	1	-15 to +15
ETHYLBENZENE	(PID)	20.0	19.9	-1	-15 to +15
M,P-XYLENE	(PID)	40.0	40.2	0	-15 to +15
O-XYLENE	(PID)	20.0	20.1	0	-15 to +15

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2425 New Holland Pike • Lancaster, PA 17601

Quality Control Summary
SDG# RCS37
Instrument ID: 5890-55
Ending Calibration Verification Summary

CCV Batch: 04099A55A
Data File: C:\DEPT25\55099B.0019.RAW
Date Injected: 04/09/04 Time Injected: 00:28
Initial Calibration Date(s): 04/07/04-04/08/04(FID)

Sample Information			
LL Sample#	Sample Code	Analysis Date	Analysis Time
4249552	EOM01	04/08/04	23:16

COMPOUND (DETECTOR)	THEORETICAL CONCENTRATION (UG/L)	ACTUAL CONCENTRATION (UG/L)	% DRIFT	%DRIFT LIMITS
TERT-BUTYL ALCOHOL (FID)	200.0	216.0	8	-25 to +25
SURR-TFT-F (FID)	30.0	29.5	-2	-43 to +46

APPENDIX A

PESTICIDES/PCBs
DATA DELIVERABLES FORMS

2E
WATER SURROGATE RECOVERY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.: GGT01

GC Column (1): RTXCLP ID: .32 GC Column (2): RTXCLPII ID: .32

SAMPLE	SAMPLE CODE NO.	TCX 1 % REC #	TCX 2 % REC #	DCB 1 % REC #	DCB 2 % REC #	TOT OUT
4267599	F-GT1	77	80	68	69	0
4267601	F-GT2	76	79	63	64	0
4267603	F-GT3	80	83	81	82	0
4267605	FGTDP	77	80	67	69	0
BLANKA	PBLKX6	70	71	70	71	0
LCSA	LCSMB	71	74	79	81	0
LCSDA	LCSDF8	69	71	76	78	0

	ADVISORY QC LIMITS	NOMINAL CONCENTRATION
TCX = Tetrachloro-m-xylene	(43 - 122)	0.151 ug/L
DCB = Decachlorobiphenyl	(13 - 130)	0.149 ug/L

Column to be used to flag recovery values

* Values outside of QC Limits

D Surrogate diluted out

3E

Water Lab Control Spike/Lab Control Spike Duplicate Recovery

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Laboratory Control Spike - Sample Code No.: LCSM8

Compound	Spike Added (ug/l)	LCS Concen (ug/l)	LCSD Concen (ug/l)	LCS % Rec #	LCSD % Rec #	LCS-LCSD % REC Limits	% RPD #	% RPD Lim
alpha-BHC	0.10	0.11		110		(56 - 122)		20
gamma-BHC (Lindane)	0.10	0.10		100		(65 - 144)		20
beta-BHC	0.10	0.11		110		(64 - 143)		20
delta-BHC	0.10	0.11		110		(41 - 155)		20
Heptachlor	0.10	0.072		72		(45 - 130)		20
Aldrin	0.100	0.047		47		(47 - 122)		20
Heptachlor epoxide	0.10	0.11		110		(73 - 141)		20
gamma-Chlordane	0.097	0.097		100		(52 - 153)		30
alpha-Chlordane	0.099	0.094		95		(62 - 135)		30
4,4'-DDE	0.20	0.18		90		(44 - 154)		20
Endosulfan I	0.10	0.11		110		(66 - 131)		20
Dieldrin	0.20	0.20		100		(71 - 129)		20
Endrin	0.20	0.20		100		(62 - 135)		20
4,4'-DDD	0.21	0.19		90		(42 - 155)		20
Endosulfan II	0.21	0.22		105		(61 - 141)		20
4,4'-DDT	0.20	0.20		100		(47 - 159)		20
Endrin aldehyde	0.20	0.18		90		(36 - 158)		20
Methoxychlor	1.0	0.94		94		(49 - 155)		20
Endosulfan sulfate	0.21	0.22		105		(56 - 140)		20
Endrin ketone	0.21	0.21		100		(61 - 139)		30

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 20 outside limits

Spike Recovery: 0 out of 20 outside limits

Comments: Results calculated on as-received basis.

Sample No.: LCSA Batch: 041270023A

1D

ORGANICS ANALYSIS DATA SHEET

SAMPLE CODE NO.: PBLKX3

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: BLANKA

Sample wt/vol: 1000 (g/ml) ml Lab File ID: 3C13120.37R

% Moisture: Decanted: (Y/N) Date Received:

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 5/7/04

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 5/7/04

Injection Volume: 2 (uL) Dilution Factor: 1

GPC Cleanup: (Y/N) N pH: Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS (UG/L or UG/KG) ug/l	Q
319-84-6	alpha-BHC	0.0020	U
58-89-9	gamma-BHC (Lindane)	0.0020	U
319-85-7	beta-BHC	0.012	U
319-86-8	delta-BHC	0.0052	JP
76-44-8	Heptachlor	0.0020	U
309-00-2	Aldrin	0.0054	JP
1024-57-3	Heptachlor epoxide	0.0020	U
5103-74-2	gamma-Chlordane	0.0079	JP
5103-71-9	alpha-Chlordane	0.0020	U
72-55-9	4,4'-DDE	0.0040	U
959-98-8	Endosulfan I	0.0040	U
60-57-1	Dieldrin	0.0050	U
72-20-8	Endrin	0.0040	U
72-54-8	4,4'-DDD	0.0040	U
33213-65-9	Endosulfan II	0.0050	U
50-29-3	4,4'-DDT	0.0040	U
7421-93-4	Endrin aldehyde	0.020	U
72-43-5	Methoxychlor	0.060	U
1031-07-8	Endosulfan sulfate	0.0090	U
53494-70-5	Endrin ketone	0.0040	U
12674-11-2	Aroclor-1016	0.20	U
11104-28-2	Aroclor-1221	0.40	U
11141-16-5	Aroclor-1232	0.10	U
53469-21-9	Aroclor-1242	0.20	U
12672-29-6	Aroclor-1248	0.30	U
11097-69-1	Aroclor-1254	0.20	U
11096-82-5	Aroclor-1260	0.30	U
8001-35-2	Toxaphene	0.30	U

4C

METHOD BLANK SUMMARY

SAMPLE CODE NO. PBLKX3

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: GGT01

Lab Sample ID BLANKA

Lab File ID: 3C13120.37R 3C13120B.37R

Matrix: (soil/water) WATER

Extraction: (SepF/Cont/Sonc) SEPF

Sulfur Cleanup: (Y/N) N

Date Extracted: 5/7/04

Date Analyzed (1): 5/7/04

Date Analyzed (2): 5/7/04

Time Analyzed (1): 21:01:21

Time Analyzed (2): 21:01:21

Instrument ID (1): H6722A

Instrument ID (2): H6722B

GC Column: RTX-CLP ID: 0.32 (mm)

GC Column: RTXCLPII ID: 0.32 (mm)

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS, AND MSD

	SAMPLE CODE NO.	LAB SAMPLEID	DATE ANALYZED 1	DATE ANALYZED 2
01	GT--1	4267595	5/7/04	5/7/04
02	GT--1MS	4267596	5/7/04	5/7/04
03	GT--1MSD	4267597	5/7/04	5/7/04
04	GT--2	4267600	5/7/04	5/7/04
05	GT--3	4267602	5/7/04	5/7/04
06	GTDP3	4267604	5/7/04	5/7/04
07	PBLKX3	BLANKA	5/7/04	5/7/04
08	LCSM8	LCSA	5/7/04	5/7/04

COMMENTS: _____

6D

INITIAL CALIBRATION - RETENTION TIME SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H6722A Calibration File: 1C13120

GC Column (1): RTX-CLP ID: 0.32 (mm) Update File:

Date(s) Analyzed: 4/30/04 4/30/04

COMPOUND	RT OF STANDARDS					MIDPOINT RT	RT WINDOW	
	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5		FROM	TO
Tetrachloro-m-xylene	4.53	4.53	4.53	4.53	4.53	4.53	4.50	4.56
Hcb	5.12	5.12	5.12	5.12	5.12	5.12	5.09	5.15
alpha-BHC	5.38	5.37	5.38	5.38	5.38	5.38	5.35	5.41
gamma-BHC (Lindane)	5.85	5.85	5.85	5.85	5.85	5.85	5.82	5.88
beta-BHC	5.97	5.97	5.97	5.97	5.97	5.97	5.94	6.00
delta-BHC	6.23	6.23	6.24	6.24	6.24	6.24	6.21	6.27
Heptachlor	6.53	6.53	6.53	6.53	6.53	6.53	6.50	6.56
Aldrin	6.96	6.96	6.96	6.96	6.96	6.96	6.93	6.99
Tefodrin	7.26	7.26	7.26	7.26	7.25	7.26	7.23	7.29
o,p-DDE	7.78	7.75	7.75	7.75	7.75	7.75	7.72	7.78
Heptachlor epoxide	7.80	7.80	7.80	7.80	7.80	7.80	7.77	7.83
gamma-Chlordane	7.96	7.98	7.96	7.96	7.96	7.96	7.93	7.99
alpha-Chlordane	8.14	8.14	8.14	8.14	8.14	8.14	8.11	8.17
4,4'-DDE	8.21	8.21	8.21	8.21	8.21	8.21	8.18	8.24
Endosulfan I	8.34	8.34	8.34	8.34	8.34	8.34	8.31	8.37
o,p-DDD	8.45	8.45	8.46	8.45	8.45	8.45	8.42	8.48
Dieldrin	8.66	8.65	8.66	8.66	8.66	8.66	8.63	8.69
o,p-DDT	8.78	8.78	8.78	8.78	8.78	8.78	8.75	8.81
Endrin	8.97	8.97	8.97	8.97	8.97	8.97	8.94	9.00
4,4'-DDD	9.00	9.00	9.00	9.01	9.00	9.00	8.97	9.03
Kepone	9.03	9.02	9.02	9.02	9.02	9.02	8.99	9.05
Endosulfan II	9.27	9.27	9.27	9.27	9.27	9.27	9.24	9.30
4,4'-DDT	9.37	9.37	9.37	9.37	9.37	9.37	9.34	9.40
Endrin aldehyde	9.82	9.82	9.82	9.82	9.82	9.82	9.79	9.85
Methoxychlor	9.97	9.97	9.97	9.97	9.97	9.97	9.94	10.00
Mirex	10.25	10.25	10.25	10.25	10.25	10.25	10.22	10.28
Endosulfan sulfate	10.39	10.39	10.39	10.39	10.39	10.39	10.36	10.42
Endrin ketone	10.77	10.77	10.77	10.77	10.77	10.77	10.74	10.80
Decachlorobiphenyl	12.16	12.15	12.15	12.15	12.15	12.15	12.12	12.18

6E

INITIAL CALIBRATION - CALIBRATION FACTOR SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H6722A Calibration File: 1C13120

GC Column (1): RTX-CLP ID: 0.32 (mm) Date(s) Analyzed: 4/30/04 4/30/04

COMPOUND	CALIBRATION FACTORS						%RSD
	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	MEAN	
Tetrachloro-m-xylene	3.87E+03	3.82E+03	3.71E+03	3.65E+03	3.56E+03	3.72E+03	3.3
Hcb	6.84E+03	6.49E+03	6.53E+03	6.21E+03	5.77E+03	6.37E+03	6.3
alpha-BHC	4.20E+03	4.50E+03	4.67E+03	4.83E+03	4.94E+03	4.63E+03	6.3
gamma-BHC (Lindane)	4.38E+03	4.55E+03	4.65E+03	4.74E+03	4.84E+03	4.63E+03	3.8
beta-BHC	2.46E+03	2.55E+03	2.48E+03	2.46E+03	2.44E+03	2.48E+03	1.8
delta-BHC	4.12E+03	4.34E+03	4.51E+03	4.64E+03	4.69E+03	4.46E+03	5.2
Heptachlor	4.95E+03	5.03E+03	4.98E+03	4.91E+03	4.90E+03	4.95E+03	1.0
Aldrin	3.88E+03	3.90E+03	3.91E+03	3.97E+03	4.00E+03	3.93E+03	1.3
Telodrin	4.40E+03	4.10E+03	4.17E+03	3.97E+03	3.82E+03	4.09E+03	5.3
o,p-DDE	2.77E+03	2.55E+03	2.61E+03	2.54E+03	2.49E+03	2.59E+03	4.1
Heptachlor epoxide	4.13E+03	4.05E+03	3.95E+03	3.90E+03	3.89E+03	3.98E+03	2.6
gamma-Chlordane	3.93E+03	3.95E+03	3.88E+03	3.87E+03	3.84E+03	3.89E+03	1.2
alpha-Chlordane	5.53E+03	4.30E+03	4.08E+03	3.99E+03	3.93E+03	4.37E+03	15.2
4,4'-DDE	3.57E+03	3.56E+03	3.58E+03	3.59E+03	3.64E+03	3.58E+03	.9
Endosulfan I	3.71E+03	3.68E+03	3.62E+03	3.57E+03	3.55E+03	3.62E+03	1.8
o,p-DDD	2.30E+03	2.18E+03	2.24E+03	2.18E+03	2.15E+03	2.21E+03	2.8
Dieldrin	3.59E+03	3.57E+03	3.59E+03	3.61E+03	3.62E+03	3.60E+03	.6
o,p-DDT	3.12E+03	2.77E+03	2.73E+03	2.66E+03	2.58E+03	2.77E+03	7.4
Endrin	3.21E+03	3.25E+03	3.27E+03	3.25E+03	3.26E+03	3.25E+03	.7
4,4'-DDD	3.33E+03	3.36E+03	3.40E+03	3.41E+03	3.47E+03	3.39E+03	1.6
Kepone	1.97E+02	2.91E+02	3.58E+02	2.57E+02	3.44E+02	2.89E+02	22.8
Endosulfan II	3.38E+03	3.37E+03	3.34E+03	3.27E+03	3.22E+03	3.32E+03	2.2
4,4'-DDT	3.11E+03	3.10E+03	3.11E+03	3.07E+03	3.09E+03	3.10E+03	.5
Endrin aldehyde	2.85E+03	2.78E+03	2.69E+03	2.63E+03	2.59E+03	2.71E+03	4.0
Methoxychlor	2.03E+03	1.88E+03	1.76E+03	1.69E+03	1.66E+03	1.80E+03	8.5
Mirex	3.21E+03	2.95E+03	2.86E+03	2.58E+03	2.34E+03	2.79E+03	12.1
Endosulfan sulfate	3.37E+03	3.15E+03	3.03E+03	2.94E+03	2.93E+03	3.09E+03	5.9
Endrin ketone	3.75E+03	3.60E+03	3.52E+03	3.49E+03	3.45E+03	3.56E+03	3.3
Decachlorobiphenyl	4.06E+03	3.72E+03	3.39E+03	3.23E+03	3.10E+03	3.50E+03	11.1

Average % RSD: 5

6F

INITIAL CALIBRATION OF MULTICOMPONENT ANALYTES

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H6722A Calibration File: 1C13120

GC Column (1): RTX-CLP ID: 0.32 (mm) Date(s) Analyzed: 4/30/04 4/30/04

COMPOUND	PEAK	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR	LEVEL	AMOUNT (ng)	PEAK HEIGHT	%RSD
Aroclor-1016	1	5.06	5.03	5.09	78	1	50	4238	8.3
						2	100	8259	
						3	200	16216	
						4	500	37273	
						5	1000	68889	
	2	5.58	5.55	5.61	131	1	50	7377	11.1
						2	100	13986	
						3	200	27185	
						4	500	61118	
						5	1000	111239	
	3	6.24	6.21	6.27	221	1	50	12211	9.2
						2	100	23282	
						3	200	45125	
						4	500	104057	
						5	1000	192995	
	4	6.43	6.40	6.46	121	1	50	6616	9.0
						2	100	12734	
						3	200	24751	
						4	500	56787	
						5	1000	105530	
	5	6.71	6.68	6.74	90	1	50	5082	10.5
						2	100	9575	
						3	200	18519	
						4	500	42107	
						5	1000	77440	
	6	6.98	6.95	7.01	101	1	50	5554	8.9
						2	100	10562	
						3	200	20875	
						4	500	47658	
						5	1000	88328	
Aroclor-1221	1	4.77	4.74	4.80	49	1	200	9714	
	2	4.99	4.96	5.02	27	1	200	5417	
	3	5.06	5.03	5.09	113	1	200	22533	
Aroclor-1232	1	5.06	5.03	5.09	87	1	200	17468	
	2	5.57	5.54	5.60	58	1	200	11618	
	3	6.24	6.21	6.27	99	1	200	19747	
	4	6.42	6.39	6.45	55	1	200	11095	
	5	6.71	6.68	6.74	37	1	200	7350	
	6	6.98	6.95	7.01	44	1	200	8755	

7D

CALIBRATION VERIFICATION SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H6722A Init. Calib Date(s): 05/07/04 05/07/04

GC Column (1) : RTX-CLP ID: .32 (mm) Date Analyzed: 05/07/04

Lab File ID: 3C13120.34R Time Analyzed: 20:00

Lab Standard ID: PEMAQ Initial Calibration: 6C13120

COMPOUND	RT	RT WINDOW FROM	TO	CALC AMOUNT (ng/ml)	NOM AMOUNT (ng/ml)	%D
Tetrachloro-m-xylene	4.50	4.47	4.53	21.74	20.10	8.1
alpha-BHC	5.35	5.32	5.38	10.86	10.00	8.6
gamma-BHC (Lindane)	5.82	5.79	5.85	10.16	10.00	1.6
beta-BHC	5.94	5.92	5.98	11.07	10.00	10.7
4,4'-DDE	8.18	8.16	8.22	0.41		
Endrin	8.94	8.91	8.97	48.19	50.10	-3.8
4,4'-DDT	9.34	9.31	9.37	93.63	100.20	-6.6
Endrin aldehyde	9.79	9.76	9.82	1.08		
Methoxychlor	9.94	9.91	9.97	209.53	250.50	-16.4
Endrin ketone	10.74	10.71	10.77	1.57		
Decachlorobiphenyl	12.11	12.08	12.14	21.11	20.00	5.5

4'4-DDT % breakdown:0.5 Endrin % breakdown: 5.2 Combined % breakdown:5.7

7E

CALIBRATION VERIFICATION SUMMARY

Lab Name: Lancaster Laboratories
Contract:
Lab Code: Case No.: SAS No.: SDG No.:
Instrument: H6722A
Init. Calib Date(s): 04/30/04 04/30/04
GC Column (1) : RTX-CLP ID: .32 (mm)
Date Analyzed: 04/30/04
Lab File ID: 1C13120.17R
Time Analyzed: 15:26
Lab Standard ID: ICMAXAA
Initial Calibration: 1C13120

COMPOUND	RT	RT WINDOW FROM	TO	CALC AMOUNT (ng/ml)	NOM AMOUNT (ng/ml)	%D
Tetrachloro-m-xylene	4.53	4.50	4.56	39.06	38.48	1.5
alpha-BHC	5.38	5.35	5.41	9.87	10.00	-1.3
gamma-BHC (Lindane)	5.85	5.82	5.88	9.96	10.00	-0.4
beta-BHC	5.97	5.94	6.00	10.42	10.00	4.2
delta-BHC	6.23	6.21	6.27	10.38	10.00	3.8
Heptachlor	6.53	6.50	6.56	10.06	10.00	0.6
Aldrin	6.96	6.93	6.99	10.48	10.00	4.8
Heptachlor epoxide	7.80	7.77	7.83	10.32	10.00	3.2
gamma-Chlordane	7.96	7.93	7.99	10.15	10.00	1.5
alpha-Chlordane	8.14	8.11	8.17	9.51	10.00	-4.9
4,4'-DDE	8.21	8.18	8.24	19.97	20.00	-0.2
Endosulfan I	8.34	8.31	8.37	10.08	10.00	0.8
Dieldrin	8.65	8.63	8.69	19.80	20.00	-1.0
Endrin	8.97	8.94	9.00	19.99	20.00	0
4,4'-DDD	9.00	8.97	9.03	20.72	20.00	3.6
Endosulfan II	9.27	9.24	9.30	20.25	20.00	1.2
4,4'-DDT	9.37	9.34	9.40	20.17	20.00	0.9
Endrin aldehyde	9.82	9.79	9.85	20.20	20.00	1.0
Methoxychlor	9.97	9.94	10.00	97.77	100.00	-2.2
Endosulfan sulfate	10.39	10.36	10.42	20.12	20.00	0.6
Endrin ketone	10.77	10.74	10.80	20.05	20.00	0.3
Decachlorobiphenyl	12.15	12.12	12.18	37.23	38.96	-4.4
					Average of %D:	1.9

FORM VII

8D
ANALYTICAL SEQUENCE

Sequence: 1C13120 Lab Name: Lancaster laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.:

GC Column: RTX-CLP ID: 0.32

Instrument: H6722A

THIS ANALYTICAL SEQUENCE OF BLANKS, SAMPLES AND STANDARDS IS GIVEN BELOW:

	Sample Code No.	Lab Sample ID	Date Analyzed	Time Analyzed	Calibration File	TCX	DCB
001	PIBLKAA	IBLKX0424A	04/30/2004	11:02:26	1C13120	4.53	12.16
002	PEMAA	EVALX03C	04/30/2004	11:42:34	1C13120	4.53	12.15
003	MIXA1AA	MIXA10424B	04/30/2004	12:02:59	1C13120	4.53	12.15
004	MIXA2AA	MIXA20424B	04/30/2004	12:23:22	1C13120	4.53	12.15
005	MIXA3AA	MIXA30424B	04/30/2004	12:43:46	1C13120	4.53	12.15
006	MIXA4AA	MIXA40424B	04/30/2004	13:04:09	1C13120	4.53	12.15
007	MIXA5AA	MIXA50424B	04/30/2004	13:24:36	1C13120	4.53	12.15
008	MIXE1AA	MIXE10424A	04/30/2004	13:44:58	1C13120	4.52	12.15
009	MIXE2AA	MIXE20424A	04/30/2004	14:05:21	1C13120	4.53	12.15
010	MIXE3AA	MIXE30424A	04/30/2004	14:25:43	1C13120	4.52	12.15
011	MIXE4AA	MIXE40424A	04/30/2004	14:46:08	1C13120	4.53	12.15
012	MIXE5AA	MIXE50424A	04/30/2004	15:06:33	1C13120	4.52	12.15
013	ICMAXAA	ICMAX0424B	04/30/2004	15:26:57	1C13120	4.53	12.15
014	TOXWXAA	TOXWX0424A	04/30/2004	15:47:19	1C13120	4.52	12.15
015	CHLDXAA	CHLDX0424A	04/30/2004	16:07:42	1C13120	4.52	12.15
016	AR161AA	AR1610424D	04/30/2004	16:28:04	1C13120	4.52	12.15
017	AR162AA	AR1620424D	04/30/2004	16:48:30	1C13120	4.52	12.15
018	AR163AA	AR1630424D	04/30/2004	17:08:51	1C13120	4.52	12.15
019	AR164AA	AR1640424E	04/30/2004	17:29:14	1C13120	4.52	12.15
020	AR165AA	AR1650424D	04/30/2004	17:49:34	1C13120	4.52	12.15
021	AR210AA	AR210424A	04/30/2004	18:09:58	1C13120	4.52	12.15
022	AR32XAA	AR32X03C	04/30/2004	18:30:20	1C13120	4.52	12.15
023	AR420AA	AR420424A	04/30/2004	18:50:43	1C13120	4.52	12.15
024	AR483AA	AR4830424A	04/30/2004	19:11:03	1C13120	4.52	12.15
025	AR543AA	AR5430424A	04/30/2004	19:31:23	1C13120	4.52	12.15
026	MDLAXAA	MDLAX0424B	04/30/2004	19:51:44	1C13120	4.52	12.15
027	MDLEXAA	MDLEX0424A	04/30/2004	20:12:08	1C13120	4.52	12.15
028	MD16XAA	MD16X0424A	04/30/2004	20:32:28	1C13120	4.52	12.15
029	MDTXXAA	MDTXX0424A	04/30/2004	20:52:49	1C13120	4.52	12.15
030	MDCHXAA	MDCHX0424A	04/30/2004	21:13:08	1C13120	4.52	12.15
031	IC16XAA	IC16X0424B	04/30/2004	21:33:30	1C13120	4.52	12.15

	ICAL Dates
1C13120	04/30/2004 - 04/30/2004
3C13120	05/01/2004 - 05/04/2004

		ICAL RT	QC Limits
TCX = Tetrachloro-m-xylene		4.53	(4.50 - 4.56 Minutes)
DCB = Decachlorobiphenyl		12.15	(12.12 - 12.18 Minutes)
TCX = Tetrachloro-m-xylene		4.52	(4.49 - 4.55 Minutes)
DCB = Decachlorobiphenyl		12.15	(12.12 - 12.18 Minutes)

10A

IDENTIFICATION SUMMARY

SAMPLE CODE NO.: PBLKX3

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Lab Sample ID: BLANKA Date(s) Analyzed: 5/7/04 5/7/04

Instrument ID (1): H6722A Instrument ID (2): H6722B

GC Column (1): RTX-CLP ID: 0.32 (mm) GC Column (2): RTXCLPII ID: 0.32 (mm)

ANALYTE	COL	RT	FROM	TO	CONCENTRATION	%D
delta-BHC	1	6.19	6.18	6.24	0.024	
	2	6.23	6.21	6.27	0.0052	128.8
Aldrin	1	6.93	6.90	6.96	0.0054	
	2	6.81	6.76	6.82	0.0039	32.3
gamma-Chlordane	1	7.94	7.90	7.96	0.014	
	2	7.83	7.78	7.84	0.0079	55.7

APPENDIX A

METALS
DATA DELIVERABLES FORMS

QUALITY ASSURANCE SUMMARY

COVER PAGE - INORGANIC ANALYSES DATA PACKAGE

Lab Name: LANCASTER_LABORATORIES

SDG No.: CLV93

Client Sample ID.	Lab Sample ID.
---46	4247579
F1-46	4247580
F2-46	4247581

Were ICP interelement corrections applied? Yes/No YES

Were ICP background corrections applied? Yes/No YES

If yes, were raw data generated before application of background corrections? Yes/No NO_

LEGEND

FLAGS: (indicate matrix interference)	U = Below MDL B = Below LOQ
N = Matrix Spike OOS	METHODS:
* = Duplicate OOS	A = Flame Atomic Absorption
W = Method F Analytical Spike Recovery <85% or >115% when the sample conc. is <50% of the spike conc.	P = Inductively Coupled Plasma
	F = Graphite Furnace
	CV = Cold Vapor
S = Analysis Determined by MSA	NR = Not Required
+ = MSA Correlation Coefficient <0.995	TERMS:
E = Matrix Effects exist as proven by Serial Dilution or Spiked Dilution	MDL = Method Detection Limit
	LOQ = Limit of Quantitation
M = Duplicate Injection Precision not met	OOS = Out of Specification
Presence of FLAGS does not invalidate data	MSA = Method of Standard Addition

I certify that this data package is technically accurate and complete. Release of the data contained in this data package has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature:_____ Name: Betsy S. Menefee_____

Date: _____ Title: Senior Specialist_____
Inorganic Analysis

QUALITY ASSURANCE SUMMARY

INORGANIC ANALYSIS DATA SHEET
FORM 1

CLIENT SAMPLE NO.

---46

Lab Name: LANCASTER_LABORATORIES___

SDG No.: CLV93

Matrix (soil/water): WATER

Lab Sample ID: 4247579

Level (low/med): LOW

Date Received: 04/02/04

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L___

CAS No.	Analyte	Concentration	C	Q	M
7439-92-1	Lead	40.7		S	F

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

QUALITY ASSURANCE SUMMARY

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LANCASTER_LABORATORIES____

SDG No.: CLV93_

Initial Calibration Source: LLI_____

Continuing Calibration Source: LLI_____

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					M
	True	Found	%R(1)	True	Found	%R(2)	Found	%R(2)	
Lead	30.0	28.93	96.4	25.0	25.14	100.6	26.59	106.4	F

(1) Control Limit: Graphite Furnace 90-110
(2) Control Limit: Graphite Furnace 80-120

QUALITY ASSURANCE SUMMARY

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LANCASTER_LABORATORIES___

SDG No.: CLV93_

Initial Calibration Source: LLI_____

Continuing Calibration Source: LLI_____

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					M
	True	Found	%R(1)	True	Found	%R(2)	Found	%R(2)	
Lead				25.0	26.50	106.0	25.07	100.3	F

(1) Control Limit: Graphite Furnace 90-110
(2) Control Limit: Graphite Furnace 80-120

QUALITY ASSURANCE SUMMARY

LOW LEVEL CHECK STANDARD FOR AA AND ICP

Lab Name: LANCASTER_LABORATORIES___

SDG No.: PSB02_

AA CRDL Standard Source: LLI_____

ICP CRDL Standard Source: LLI_____

Concentration Units: ug/L

Analyte	AA			ICP				
				Initial			Final	
	True	Found	%R	True	Found	%R	Found	%R
Aluminum				200.0	212.80	106.4	215.06	107.5
Antimony				20.0	10.83	54.2	13.86	69.3
Arsenic				10.0	8.76	87.6	9.87	98.7
Barium				5.0	5.35	107.0	5.42	108.4
Beryllium				5.0	5.08	101.6	5.06	101.2
Cadmium				5.0	5.10	102.0	5.05	101.0
Calcium				200.0	206.33	103.2	206.49	103.2
Chromium				5.0	4.36	87.2	5.35	107.0
Cobalt				5.0	5.14	102.8	4.77	95.4
Copper				10.0	10.68	106.8	10.31	103.1
Iron				200.0	214.98	107.5	210.97	105.5
Lead				20.0	17.93	89.6	20.65	103.2
Magnesium				100.0	98.62	98.6	95.58	95.6
Manganese				5.0	5.13	102.6	5.25	105.0
Mercury	0.2	0.20	100.0					
Nickel				10.0	9.22	92.2	10.25	102.5
Potassium				500.0	506.48	101.3	504.46	100.9
Selenium				10.0	8.44	84.4	12.06	120.6
Silver				5.0	5.32	106.4	5.11	102.2
Sodium				1000.0	903.67	90.4	902.79	90.3
Thallium				20.0	24.17	120.8	21.38	106.9
Vanadium				5.0	5.53	110.6	5.24	104.8
Zinc				20.0	20.74	103.7	21.16	105.8

Control Limits: All Metals 50-150% for samples < 10 times the value of the low level check standard

QUALITY ASSURANCE SUMMARY

CRDL STANDARD FOR AA AND ICP

Lab Name: LANCASTER_LABORATORIES___

SDG No.: CLV93_

AA CRDL Standard Source: LLI_____

ICP CRDL Standard Source: LLI_____

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
				Initial			Final	
	True	Found	%R	True	Found	%R	Found	%R
Lead	3.0	2.42	80.7					

QUALITY ASSURANCE SUMMARY

BLANKS

Lab Name: LANCASTER_LABORATORIES___

SDG No.: CLV93_

Preparation Blank Matrix (soil/water): _WATER____

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L_____

Analyte	Initial Calibration Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Lead	-1.8	B	-1.8	B	-1.8	B	-1.8	B	-1.746	B	F

QUALITY ASSURANCE SUMMARY

MATRIX SPIKE/MATRIX SPIKE DUPLICATE

Lab Name: LANCASTER_LABORATORIES

SDG No.: CLV93

Matrix (soil/water): WATER_____

% Solids for Sample: 0.0

Concentration Units (ug/L or mg/kg dry weight): ug/L

Level (low/med): LOW

CLIENT SAMPLE NO.

*47556S

Analyte	M	Sample Result	C	MS Sample Result	C	MSD Sample Result	C	MS Spike Added	MSD Spike Added	MS %R	Q	MSD %R	Q	Control Limit %R	RPD	Q	Ctl Lim RPD
Lead	F	1.2000	U	18.6510		18.9508		20.00	20.00	93		95		80 - 120	2		20

QUALITY ASSURANCE SUMMARY

POST DIGEST SPIKE SAMPLE RECOVERY

CLIENT SAMPLE NO.

*47556A

Lab Name: LANCASTER_LABORATORIES

SDG No.: CLV93

Matrix (soil/water): WATER_____

Level (low/med): LOW

Concentration Units: ug/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Lead		12.13		1.20	U	20.0	61		F

Comments:

QUALITY ASSURANCE SUMMARY

CLIENT SAMPLE No.

DUPLICATES

*47556D

Lab Name: LANCASTER_LABORATORIES___

SDG No.: CLV93___

Matrix (soil/water): WATER_____ Level (low/med): LOW

% Solids for Sample: 0.0 % Solids for Duplicate: 0.0

Concentration Units (ug/L or mg/kg dry weight): ug/L

Analyte	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Lead		1.2000	U	1.2000	U			F

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample page of the Quality Assurance Summary.

QUALITY ASSURANCE SUMMARY

LABORATORY CONTROL SAMPLE

Lab Name: LANCASTER_LABORATORIES___

SDG No.: CLV93___

Solid LCS Source: _____

Aqueous LCS Source: LLI_____

Analyte	Aqueous (ug/L) True	Found	%R(1)	Solid (mg/kg) True	Found	C	Limit		%R
Lead	20.0	20.29	101						

Control Limits: Statistically determined

QUALITY ASSURANCE SUMMARY

STANDARD ADDITION RESULTS

Lab Name: LANCASTER_LABORATORIES_____

SDG No.: CLV93__

Concentration Units: ug/L

Client Sample No.	An	0 ADD FOUND CON	C	1 ADD SPIKE CON	FOUND Con	C	Corrected Final Conc.	C
*47556	PB	1.2000	U	20.00	12.7045		1.2000	U
*47556D	PB	1.2000	U	20.00	12.0647		1.2000	U
*47558M	PB	12.4791		20.00	25.6491		18.9508	
*47558S	PB	12.2768		20.00	25.4416		18.6509	
---46	PB	30.8982		20.00	46.0720		40.7257	
F1-46	PB	17.1621		20.00	33.5462		20.9497	
F2-46	PB	17.8272		20.00	35.4614		20.2189	

QUALITY ASSURANCE SUMMARY

ICP SERIAL DILUTIONS

CLIENT SAMPLE NO.

*67024 L

Lab Name: LANCASTER_LABORATORIES___

SDG No.: MVA15___

Matrix (soil/water): WATER_____

Level (low/med): LOW

Concentration Units: ug/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Antimony							NR
Arsenic	9.40	U	47.00	U			P
Barium	227.56		235.60		3.5		P
Beryllium	0.97	U	4.85	U			P
Cadmium	0.76	U	3.80	U			P
Chromium	3.00	U	15.00	U			P
Cobalt	2.00	U	10.00	U			P
Copper	2.70	U	13.50	U			P
Lead	10.00	U	50.00	U			P
Mercury							NR
Nickel	7.05	B	25.50	U	100		P
Selenium	5.90	U	29.50	U			P
Silver	2.00	U	10.00	U			P
Thallium	9.90	U	49.50	U			P
Tin	5.62	B	25.00	U	100		P
Vanadium	1.60	U	8.00	U			P
Zinc	146.62		154.45		5.3		P

NOTE: An (E) in column "Q" indicates the presence of a chemical or physical interference in the matrix during analysis (% Difference > 10% when (I)> or = 50x MDL for ICP or (I) > or = 25x MDL for GFAA).

QUALITY ASSURANCE SUMMARY

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: LANCASTER_LABORATORIES___

SDG No.: PSB02___

ICP ID Number: ___08643 ____ Date: 04/15/04

Flame AA ID Number: _____

Furnace AA ID Number: _____

Analyte	Wave-length (nm)	Back-ground	IDL (ug/L)	M
Aluminum	308.21		30.0	P
Antimony	206.83		2.9	P
Arsenic	189.04		4.6	P
Barium	493.40		0.15	P
Beryllium	313.04		0.28	P
Cadmium	226.50		0.64	P
Calcium	317.93		9.8	P
Chromium	267.71		2.5	P
Cobalt	228.61		1.4	P
Copper	324.75		1.1	P
Iron	259.94		36.1	P
Lead	220.35		2.4	P
Magnesium	279.07		8.4	P
Manganese	257.61		0.13	P
Mercury				NR
Nickel	231.60		2.2	P
Potassium	766.49		18.1	P
Selenium	196.02		3.8	P
Silver	328.06		1.1	P
Sodium	330.23		225	P
Thallium	190.86		3.8	P
Vanadium	292.40		2.2	P
Zinc	206.20		1.4	P

Comments:

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QUALITY ASSURANCE SUMMARY

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: LANCASTER_LABORATORIES___

SDG No.: PSB02___

ICP ID Number: _____ Date: 04/15/04

Flame AA ID Number: ___62347 ____

Furnace AA ID Number: _____

Analyte	Wave-length (nm)	Back-ground	IDL (ug/L)	M
Aluminum				NR
Antimony				NR
Arsenic				NR
Barium				NR
Beryllium				NR
Cadmium				NR
Calcium				NR
Chromium				NR
Cobalt				NR
Copper				NR
Iron				NR
Lead				NR
Magnesium				NR
Manganese				NR
Mercury	254.00		0.052	CV
Nickel				NR
Potassium				NR
Selenium				NR
Silver				NR
Sodium				NR
Thallium				NR
Vanadium				NR
Zinc				NR

Comments:

QUALITY ASSURANCE SUMMARY

METHOD DETECTION LIMITS (ANNUALLY)

Lab Name: LANCASTER_LABORATORIES

SDG No.: PSB02

Method: _P_ Matrix: (soil/water): WATER Date: 05/01/04

Analyte	Wave-length (nm)	Back-ground	LOQ (ug/L)	MDL (ug/L)
Aluminum	308.21		200	39.8
Antimony	206.83		20.0	9.2
Arsenic	189.04		10.0	9.4
Barium	493.40		5.0	0.45
Beryllium	313.04		5.0	0.97
Cadmium	226.50		5.0	0.76
Calcium	317.93		200	47.9
Chromium	267.71		5.0	3.0
Cobalt	228.61		5.0	2.0
Copper	324.75		10.0	2.7
Iron	259.94		200	49.5
Lead	220.35		20.0	10.0
Magnesium	279.07		100	19.3
Manganese	257.61		5.0	0.84
Mercury				
Nickel	231.60		10.0	5.1
Potassium	766.49		500	57.1
Selenium	196.02		10.0	5.9
Silver	328.06		5.0	2.0
Sodium	330.23		1000	462
Thallium	190.86		20.0	9.9
Vanadium	292.40		5.0	1.6
Zinc	206.20		20.0	4.8

** The LOQ must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug.

Comments:

QUALITY ASSURANCE SUMMARY

METHOD DETECTION LIMITS (ANNUALLY)

Lab Name: LANCASTER_LABORATORIES

SDG No.: PSB02

Method: _CV_ Matrix: (soil/water): WATER Date: 05/01/04

Analyte	Wave-length (nm)	Back-ground	LOQ (ug/L)	MDL (ug/L)
Aluminum				
Antimony				
Arsenic				
Barium				
Beryllium				
Cadmium				
Calcium				
Chromium				
Cobalt				
Copper				
Iron				
Lead				
Magnesium				
Manganese				
Mercury	254.00		0.20	0.028
Nickel				
Potassium				
Selenium				
Silver				
Sodium				
Thallium				
Vanadium				
Zinc				

** The LOQ must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug.

Comments:

QUALITY ASSURANCE SUMMARY

ICP INTERELEMENT CORRECTION FACTORS (ANNUALLY)

Lab Name: LANCASTER_LABORATORIES___ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: MVA15___

ICP ID Number: ___05936____ Date: 4/8/04

Analyte	Wave-length (nm)	Interelement Correction Factor for: AL	CA	FE	MG	CO
Antimony	206.83	0.0000000	0.0000000	0.0000220	0.0000000	0.0000000
Arsenic	189.04	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	493.40	0.0000000	0.0000020	0.0000050	0.0000000	0.0000000
Beryllium	313.04	0.0000020	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.50	0.0000010	0.0000000	0.0000640	0.0000000	-0.0001740
Chromium	267.71	0.0000000	0.0000000	0.0000000	0.0000030	0.0000000
Cobalt	228.61	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Copper	324.75	0.0000010	0.0000000	0.0000000	0.0000000	0.0000000
Lead1	220.35	0.0004780	0.0000000	0.0000990	0.0000170	0.0000920
Lead2	220.35	-0.0002980	0.0000000	0.0000320	0.0000000	0.0000000
Mercury						
Nickel	231.60	0.0000000	0.0000000	0.0000000	0.0000000	-0.0006670
Selenium1	196.02	0.0000180	0.0000000	0.0000310	0.0000000	0.0003240
Selenium2	196.02	0.0000020	0.0000000	-0.0003360	0.0000000	-0.0005540
Silver	328.06	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.86	-0.0000900	0.0000000	-0.0000690	0.0000000	0.0031230
Tin	189.98	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Vanadium	292.40	0.0000000	0.0000000	-0.0002730	0.0000000	0.0000000
Zinc	206.20	0.0000110	0.0000000	-0.0000500	0.0000860	0.0000000

Comments:

QUALITY ASSURANCE SUMMARY

ICP INTERELEMENT CORRECTION FACTORS (ANNUALLY)

Lab Name: LANCASTER_LABORATORIES___ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: MVA15___

ICP ID Number: ___05936____ Date: 4/8/04

Analyte	Wave-length (nm)	Interelement Correction Factor for: CR	MN	MO	NI	SB
Antimony	206.83	-0.0029130	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.04	-0.0049740	0.0000000	-0.0029600	0.0000000	0.0000000
Barium	493.40	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	313.04	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.50	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.71	0.0000000	0.0000620	0.0000000	0.0000000	0.0000000
Cobalt	228.61	-0.0003570	0.0000000	-0.0002670	0.0001680	0.0000000
Copper	324.75	0.0000000	0.0000000	-0.0003110	0.0000000	0.0000000
Lead1	220.35	0.0000270	0.0001030	0.0000000	0.0006100	0.0001120
Lead2	220.35	-0.0000540	0.0000940	-0.0010200	0.0000000	0.0000000
Mercury						
Nickel	231.60	0.0000000	0.0000000	0.0000000	0.0000000	-0.0001340
Selenium1	196.02	0.0000710	0.0003840	0.0004630	0.0000000	0.0000000
Selenium2	196.02	-0.0000900	0.0001860	0.0000000	0.0000000	0.0000000
Silver	328.06	0.0000130	-0.0001000	-0.0004360	0.0000000	0.0000000
Thallium	190.86	0.0002630	-0.0030360	-0.0008050	0.0000000	0.0000000
Tin	189.98	-0.0001000	0.0000000	0.0000000	0.0000000	0.0000000
Vanadium	292.40	-0.0012400	0.0001270	0.0000000	0.0000000	0.0000000
Zinc	206.20	0.0002920	0.0000000	0.0003360	0.0000000	0.0000000

Comments:

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QUALITY ASSURANCE SUMMARY

ICP INTERELEMENT CORRECTION FACTORS (ANNUALLY)

Lab Name: LANCASTER_LABORATORIES___ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: MVA15___

ICP ID Number: ___05936____ Date: 4/8/04

Analyte	Wave-length (nm)	Interelement Correction Factor for: SR	TI	TL	V	--
Antimony	206.83	0.0000000	-0.0022200	0.0000000	0.0000000	
Arsenic	189.04	0.0000000	0.0000000	0.0000000	-0.0001800	
Barium	493.40	0.0000000	0.0000000	0.0000000	0.0000000	
Beryllium	313.04	0.0000000	0.0000000	0.0000000	0.0013800	
Cadmium	226.50	0.0000000	0.0000000	0.0000000	0.0000000	
Chromium	267.71	0.0000000	0.0000000	0.0000000	-0.0001000	
Cobalt	228.61	0.0000000	0.0016970	0.0000000	0.0000330	
Copper	324.75	0.0000000	0.0000000	0.0000000	0.0000280	
Lead1	220.35	0.0000000	0.0007750	0.0000000	0.0000000	
Lead2	220.35	0.0000000	-0.0008300	0.0000000	-0.0001500	
Mercury						
Nickel	231.60	0.0000000	0.0000000	-0.0006600	0.0000000	
Selenium1	196.02	0.0000000	0.0000000	0.0000000	0.0001670	
Selenium2	196.02	0.0000000	0.0000000	0.0000000	-0.0001100	
Silver	328.06	0.0000000	0.0000000	0.0000000	0.0000440	
Thallium	190.86	0.0000000	0.0007800	0.0000000	0.0017640	
Tin	189.98	0.0000000	0.0000000	0.0000000	0.0000000	
Vanadium	292.40	0.0000000	0.0006160	0.0000000	0.0000000	
Zinc	206.20	0.0002330	0.0000000	0.0000000	0.0000000	

Comments:

_____

_____

_____

_____

QUALITY ASSURANCE SUMMARY

ICP LINEAR RANGES (QUARTERLY)

Lab Name: LANCASTER_LABORATORIES___

SDG No.: MVA15___

ICP ID Number: ___05936 ____ Date: 04/15/04

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	M
Antimony	10.00	50000.0	P
Arsenic	10.00	50000.0	P
Barium	10.00	10000.0	P
Beryllium	10.00	10000.0	P
Cadmium	10.00	50000.0	P
Chromium	10.00	120000.0	P
Cobalt	10.00	70000.0	P
Copper	10.00	70000.0	P
Lead	10.00	70000.0	P
Mercury			NR
Nickel	10.00	50000.0	P
Selenium	10.00	10000.0	P
Silver	10.00	10000.0	P
Thallium	10.00	20000.0	P
Tin	10.00	20000.0	P
Vanadium	10.00	30000.0	P
Zinc	10.00	35000.0	P

Comments:

QUALITY ASSURANCE SUMMARY

PREPARATION LOG

Lab Name: LANCASTER_LABORATORIES___

SDG No.: CLV93___

Method: F_

EPA Sample No.	Preparation Date	Weight (gram)	Volume (ml)
*47556	04/05/04		50
*47556D	04/05/04		50
*47556M	04/05/04		50
*47556S	04/05/04		50
---46	04/05/04		50
F1-46	04/05/04		50
F2-46	04/05/04		50
LCSW	04/05/04		50
PBW	04/05/04		50

QUALITY ASSURANCE SUMMARY

ANALYSIS RUN LOG

Lab Name: LANCASTER_LABORATORIES____

SDG No.: PSB02____

Instrument ID Number: 62347_________ Method: CV

Start Date: 05/11/04 End Date: 05/11/04

EPA Sample No.	D/F	Time	% R	Analytes																													
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN							
S0	1.00	0654																X															
S0.2	1.00	0655																X															
S0.5	1.00	0657																X															
S1.0	1.00	0658																X															
S2.5	1.00	0659																X															
S5.0	1.00	0700																X															
ICV	1.00	0702																X															
ICB	1.00	0704																X															
CRA	1.00	0705																X															
CCV	1.00	0706																X															
CCB	1.00	0707																X															
ZZZZZZ	1.00	0708																															
ZZZZZZ	1.00	0710																															
ZZZZZZ	1.00	0711																															
ZZZZZZ	1.00	0713																															
ZZZZZZ	1.00	0715																															
ZZZZZZ	1.00	0716																															
ZZZZZZ	1.00	0717																															
ZZZZZZ	1.00	0718																															
ZZZZZZ	1.00	0719																															
ZZZZZZ	1.00	0720																															
CCV	1.00	0721																X															
CCB	1.00	0723																X															
ZZZZZZ	1.00	0724																															
ZZZZZZ	1.00	0726																															
ZZZZZZ	1.00	0727																															
ZZZZZZ	1.00	0728																															
ZZZZZZ	1.00	0729																															
ZZZZZZ	1.00	0731																															
ZZZZZZ	1.00	0732																															
ZZZZZZ	1.00	0734																															
ZZZZZZ	1.00	0735																															

QUALITY ASSURANCE SUMMARY

ANALYSIS RUN LOG

Lab Name: LANCASTER_LABORATORIES___

SDG No.: PSB02___

Instrument ID Number: 62347________ Method: CV

Start Date: 05/11/04 End Date: 05/11/04

EPA Sample No.	D/P	Time	% R	Analytes																													
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN							
ZZZZZZ	1.00	0737																															
CCV	1.00	0738																X															
CCB	1.00	0739																X															
ZZZZZZ	1.00	0740																															
ZZZZZZ	1.00	0741																															
ZZZZZZ	1.00	0744																															
ZZZZZZ	1.00	0745																															
ZZZZZZ	1.00	0746																															
ZZZZZZ	1.00	0748																															
ZZZZZZ	1.00	0749																															
ZZZZZZ	1.00	0750																															
ZZZZZZ	1.00	0751																															
ZZZZZZ	1.00	0753																															
CCV	1.00	0755																X															
CCB	1.00	0756																X															
ZZZZZZ	1.00	0757																															
ZZZZZZ	1.00	0758																															
ZZZZZZ	1.00	0800																															
ZZZZZZ	1.00	0801																															
ZZZZZZ	1.00	0803																															
ZZZZZZ	1.00	0804																															
ZZZZZZ	1.00	0805																															
ZZZZZZ	1.00	0806																															
ZZZZZZ	1.00	0808																															
ZZZZZZ	1.00	0809																															
CCV	1.00	0810																X															
CCB	1.00	0812																X															
ZZZZZZ	1.00	0813																															
ZZZZZZ	1.00	0814																															
ZZZZZZ	1.00	0816																															
ZZZZZZ	1.00	0817																															
ZZZZZZ	1.00	0819																															

QUALITY ASSURANCE SUMMARY

ANALYSIS RUN LOG

Lab Name: LANCASTER_LABORATORIES___

SDG No.: PSB02___

Instrument ID Number: 62347_____ Method: CV

Start Date: 05/11/04 End Date: 05/11/04

EPA Sample No.	D/F	Time	% R	Analytes																																	
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN											
ZZZZZZ	1.00	0820																																			
ZZZZZZ	1.00	0822																																			
ZZZZZZ	1.00	0823																																			
ZZZZZZ	1.00	0825																																			
PBW	1.00	0826																X																			
CCV	1.00	0827																X																			
CCB	1.00	0828																X																			
LCSW	1.00	0830																X																			
554FB	1.00	0831																X																			
ZZZZZZ	1.00	0833																																			
ZZZZZZ	1.00	0834																																			
ZZZZZZ	1.00	0836																																			
ZZZZZZ	1.00	0837																																			
ZZZZZZ	1.00	0839																																			
ZZZZZZ	1.00	0840																																			
CCV	1.00	0842																X																			
CCB	1.00	0843																X																			

IDL-MDL FORM

SDG Number: CLV93
Matrix: W

Analyte	IDL	MDL	LOQ
Lead	0.29	1.2	3

APPENDIX A

WET CHEMISTRY
DATA DELIVERABLES FORMS

Lancaster Laboratories

Quality Control Summary
Method Blank
Miscellaneous Wet Chemistry
SDG: ICE01

Method Blank Analysis — Matrix: SOIL

Parameter	Sample Number	Sample Code	Method	Analysis Date	Batch Number	Blank Results	Units	MDL	LOQ
Fluoride	4249680	RXP5A	M	4/13/04	04099144801	ND	mg/L	0.03	0.1
	4249681	RXP5B							
	4249682	RXP9A							
	P249217	B							
	P249218	MS							
	P249219	MSD							
	P249220	D							

Comments: The blank is acceptable when the result is less than the limit of quantitation.

ABBREVIATION KEY

CO = Colorimetric	MDL = Method Detection Limit
DI = Distillation	LOQ = Limit of Quantitation
G = Gravimetric	NA = Not Applicable
IR = Infrared Spectrophotometry	J = Estimated Value < LOQ
M = Meter	MSD = Matrix Spike Duplicate
OD = Oven Dried	ND = Not Detected
TI = Titration	* = Out of Specification
B = Background	D = Duplicate
MS = Matrix Spike	LS = Low Spike
HS = High Spike	PDS = Post Digestion Spike (P)

Lancaster Laboratories

Quality Control Summary
Duplicate Analysis
Miscellaneous Wet Chemistry
SDG: EWA79

Sample Info.	Duplicate Analysis										Matrix: SOIL	
Sample Number	Sample Code	Batch #	Parameter	ME	Analysis Date	BKG Sample	BKG Results	DUP Sample	DUP Results	Units	RPD (%)	Control Limits % </=
4214401	GW773	04043820002	Moisture	OD	2/12/04	4214401	19.61	4214401	19.56	%	0	15
4214402	GW720											
4214403	GW721											
4214404	GW72D											
4214405	GP771											

Comments: If the background and/or the duplicate result was less than the limit of quantitation, the RPD is not required.

If the background and/or duplicate result is less than five times the limit of quantitation, the RPD is not considered applicable and is program deleted.

ABBREVIATION KEY

CO = Colorimetric	MDL = Method Detection Limit
DI = Distillation	LOQ = Limit of Quantitation
G = Gravimetric	NA = Not Applicable
IR = Infrared Spectrophotometry	J = Estimated Value < LOQ
M = Meter	ME = Method
OD = Oven Dried	ND = Not Detected
TI = Titration	* = Out of Specification

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Lancaster Laboratories

Quality Control Summary
Laboratory Control Standard
Laboratory Control Standard Duplicate
Miscellaneous Wet Chemistry
SDG: EWA79

Matrix: SOIL

Sample Info.	Laboratory Control Standards											
Sample Number	Sample Code	Batch #	Parameter	ME	Analysis Date	TRUE LCS/LCSD Value	LCS Results	LCSD Results	Units	Acceptance Range	% RPD Results	% RPD Acceptance <=
4214401	GW773	04043820002	Moisture	OD	2/12/04	89.5	89.28	NA	%	88.6 - 90.4	NA	NA
4214402	GW720											
4214403	GW721											
4214404	GW72D											
4214405	GP771											

16.15

Lancaster Laboratories

Quality Control Summary
Matrix Spike Analysis/ Matrix Spike Duplicate
Miscellaneous Wet Chemistry
SDG: ICE01

Sample Info. — Matrix Spike Analysis — Matrix: SOIL

Sample Number	Sample Code	Batch Number	Parameter	ME	Analysis Date	BKG Sample	BKG Result	MS Sample	MS Spike Added	MS Result	MSD Sample	MSD Spike Added	MSD Result	Units	MS Rec (%)	MSD Rec (%)	Acceptance Window (%)	RPD (%)	% RPD Limits </=
4249680	RXP5A	04099144801	Fluoride	M	4/13/04	P249217	0.28	P249218	1	1.28	P249219	1	1.27	mg/L	98	99	80 - 112	1	5
4249681	RXP5B																		
4249682	RXP9A																		

If the background and/or matrix spike/matrix spike duplicate result is less than five times the limit of quantitation, the RPD is not considered applicable and is program deleted.

If the background result was more than four times the spike added amount, the percent recovery is program deleted.

ABBREVIATION KEY

CO = Colorimetric	ND = Not Detected
DI = Distillation	ME = Method
G = Gravimetric	MS = Matrix Spike
IR = Infrared Spectrophotometry	NA = Not Applicable
M = Meter	LOQ = Limit of Quantitation
OD = Oven Dried	* = Out of Specification
TI = Titration	J = Estimated Value < LOQ
MSD = Matrix Spike Duplicate	

APPENDIX A

INSTRUMENTAL WATER QUALITY DATA DELIVERABLES FORMS

Lancaster Laboratories

Quality Control Summary
Method Blank
Instrumental Water Quality
Matrix: SOIL
SDG: DPA03

Analyte	Analysis Date	Method	Batch Number	Blank Results	Units	MDL	LOQ
Nitrate	04/14/04	IC	04105105201	ND	mg/kg	0.8	1.5
Nitrite	04/14/04	IC	04105105201	ND	mg/kg	0.8	1
Total Phosphorus as PO4	04/07/04	AK	04096110201	ND	mg/kg	10	20
TOC Combustion	04/05/04	TOC	04096011131	ND	mg/kg	60	170

Comments: The blank is acceptable when the result is less than the limit of quantitation.

ABBREVIATION KEY

AK = Alpkem
DOC = Dissolved Organic Carbon
IC = Ion Chromatography
TKN = Total Kjeldahl Nitrogen
TOC = Total Organic Carbon
TOX = Total Organic Halogen
J = Estimated Value
LOQ = Limit of Quantitation
MDL = Method Detection Limit
NA = Not Applicable
ND = Not Detected

Lancaster Laboratories

Quality Control Summary
Duplicate Sample Analysis
Instrumental Water Quality
Matrix: SOIL
SDG: DPA03

Sample Number	Sample Code	Analyte	Analysis Date	Method	Batch #	Sample Result	Duplicate Result	Units	RPD (%)	Control Limits %
4247255	E5-12	Nitrate	04/14/04	IC	04105105201A	ND	ND	mg/kg	NA	NA
4247255	E5-12	Nitrite	04/14/04	IC	04105105201A	ND	ND	mg/kg	NA	NA
4247255	E5-12	Total Phosphorus as PO4	04/07/04	AK	04096110201A	377.8	341.5	mg/kg	10	13
4246405	EE108	TOC Combustion	04/05/04	TOC	04096011131A	1048	972	mg/kg	NA	NA
4247255	E5-12	TOC Combustion	04/06/04	TOC	04096011131B	1552	1501	mg/kg	3	14

Comments: If the background and/or the duplicate result was less than the limit of quantitation, the RPD is not required.

If the background and/or duplicate result is less than five times the limit of quantitation, the RPD is not considered applicable and is program deleted.

ABBREVIATION KEY

AK = Alpkem
DOC = Dissolved Organic Carbon
IC = Ion Chromatography
RA = Rapid Analyzer
TKN = Total Kjeldahl Nitrogen
TOC = Total Organic Carbon
TOX = Total Organic Halogen
D = Duplicate
ME = Method
NA = Not Applicable
ND = Non Detected
* = Out of Specification
J = Estimated Value < LOQ

Lancaster Laboratories

Quality Control Summary
Laboratory Control Standard (LCS)
Laboratory Control Standard Duplicate (LCSD)
Instrumental Water Quality
Matrix: SOIL
SDG: DPA03

Batch Numbers	Analyte	Analysis Date	ME	True LCS/LCSD Value	LCS Results	LCSD Results	Units	Acceptance Range	% RPD Results	% RPD Acceptance <=
04105105201	Nitrate	04/14/04	IC	100	100.6054	NA	mg/kg	89.5 - 110.4	NA	NA
04105105201	Nitrite	04/14/04	IC	100	99.6400	NA	mg/kg	89.5 - 110.4	NA	NA
04096110201	Total Phosphorus as PO4	04/07/04	AK	1535	1535	NA	mg/kg	1373.8 - 1694.6	NA	NA
04096011131	TOC Combustion	04/05/04	TOC	7480	7669	NA	mg/kg	4877 - 9522	NA	NA

ABBREVIATION KEY

AK = Alpkem
DOC = Dissolved Organic Carbon
IC = Ion Chromatography
TKN = Total Kjeldahl Nitrogen
TOC = Total Organic Carbon
TOX = Total Organic Halogen
ME = Method
NA = Not Applicable
ND = Not Detected
* = Out of Specification
RA = Rapid Analyzer

Lancaster Laboratories

Quality Control Summary
Matrix Spike (MS)
Matrix Spike Duplicate (MSD)
Instrumental Water Quality
Matrix: SOIL
SDG: DPA03

Sample Number	Sample Code	Analyte	Spike Analysis Date	ME	Batch #	Sample Result	MS Spike Added	MSD Spike Added	MS Result	MSD Result	Units	MS Rec (%)	MSD Rec (%)	Acceptance Window (%)	RPD (%)	%RPD Limits
4247255	E5-12	Nitrate	04/14/04	IC	04105105201A	ND	99	NA	87.8130	NA	mg/kg	89	NA	90 - 110	NA	NA
4247255	E5-12	Nitrite	04/14/04	IC	04105105201A	ND	99	NA	86.9431	NA	mg/kg	88	NA	90 - 110	NA	NA
4247255	E5-12	Total Phosphorus as PO4	04/07/04	AK	04096110201A	377.8	2853	NA	3143.2	NA	mg/kg	97	NA	88 - 133	NA	NA
4246405	EE108	TOC Combustion	04/05/04	TOC	04096011131A	1048	300000	NA	310700	NA	mg/kg	103	NA	71 - 136	NA	NA
4247255	E5-12	TOC Combustion	04/05/04	TOC	04096011131B	1552	277778	NA	288519	NA	mg/kg	103	NA	71 - 136	NA	NA

Comments:

If the matrix spike/matrix spike duplicate results are less than five times the limit of quantitation, the RPD is not considered applicable and is program deleted.

If the background result was more than four times the spike added amount the percent recovery is program deleted.

ABBREVIATION KEY

AK = Alpkem
DOC = Dissolved Organic Carbon
IC = Ion Chromatography
RA = Rapid Analyzer
TKN = Total Kjeldahl Nitrogen
TOC = Total Organic Carbon
TOX = Total Organic Halogen

J = Estimated Value < LOQ
LOQ = Limit of Quantitation
ME = Method
NA = Not Applicable
ND = Non Detected
R = Spike
M = Spike Duplicate
* = Out of Specification

Lancaster Laboratories

Quality Control Summary
Initial And Continuing Calibration
Instrumental Analysis
Total Phosphorus as PO4
SDG: DPA03
Instrument Identification: 4758

*=Out of Specifications

Initial Calibration Date: 04/07/04
Continuing Calibration Dates: 04/07/04

	True Value (mg/L)	Acceptance Range
ICV/CCV	Varies	+/- 10%
ICB/CCB	0	< LOQ

Initial Calibration Verification/Blank	True Value	Result (mg/L)	% Recovery
ICV	2.5	2.42356	97
ICB	0	ND	NA

Continuing Calibration Verification/Blank	True Value	Result (mg/L)	% Recovery
CCV1	1	0.93371	93
CCB 1	0	ND	NA
CCV2	2.5	2.42808	97
CCB 2	0	ND	NA
CCV3	3.5	3.40747	97
CCB 3	0	ND	NA
CCV2	2.5	2.43314	97
CCB 4	0	ND	NA
CCV1	1	0.93850	94
CCB 5	0	ND	NA
CCV2	2.5	2.44059	98
CCB 6	0	ND	NA

Lancaster Laboratories

Quality Control Summary
Initial and Continuing Calibration
Instrumental Analysis/Anion Scan

Instrument Identification: 08022
Calibration Date: 04/13/04
SDG: DPA03

Batch Number	Analysis/ Parameter	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
04105105201A	Fluoride Chloride Nitrite-N	37778	156841	399491	829125	1280536	0.999474	0.999737
	Bromide Nitrate-N Orthophosphate Sulfate	43168	172340	435184	911660	1415962	0.999167	0.999583

ICV/CCV Control Limits: 90% - 110% ICB/CCB < LOQ of the Analyte Concentration units: mg/L

Calibration Dates: 04/13/04, 04/14/04

Analyte	Initial Calibration Verification/Blank True	ICV	%Rec	ICB	Continuing Calibration Verification/Blank True	CCV1	%Rec	CCB1
Fl Cl NO2	1.5	1.4776	99	0.0000	1.5	1.4715	98	0.0000
Br NO3 O-PO4 SO4	1.5	1.4903	99	0.0000	1.5	1.4771	98	0.0503

Analyte	Continuing Calibration Verification/Blank True	CCV2	%Rec	CCB2	Continuing Calibration Verification/Blank True	CCV3	%Rec	CCB3
Fl Cl NO2	2.5	2.5179	101	0.0447				
Br NO3 O-PO4 SO4	2.5	2.5168	101	0.0452				

Lancaster Labortories

Correlation Coefficient: 0.9991

Quality Control Summary
Initial Calibration & Linearity Check
Instrumental Analysis
Total Organic Carbon Combustion
Instrument Identification: 8610
Calibration Date: 04/02/04
MATRIX: SOIL
SDG: DPA03

Blank:	0 cts
Blank:	0 cts
Blank:	0 cts
Average:	0 cts

Batch Number	STD. 0.09 mg C	STD. 0.45 mg C	STD. 1.80 mg C	STD. 6.00 mg C
040906011131A	240	1214	4400	14353
040906011131B				

UNITS= CTS

Continuing Calibration Verification	TRUE Value	Result (mg/L)	% Recovery
CCV	1.5	1.543	103
CCV	3	3.046	102
CCV	4.5	4.605	102
CCV	1.5	1.560	104
CCV	3	3.109	104
CCV	4.5	4.387	97

Continuing Calibration Dates: 4/05/04, 4/06/04

	True Value (mg/L)	Acceptance Range
ICV/CCV	Varies	+/- 10%

* Out of Specification CCVs/CCBs are immediately followed by two acceptable CCVs/CCBs.